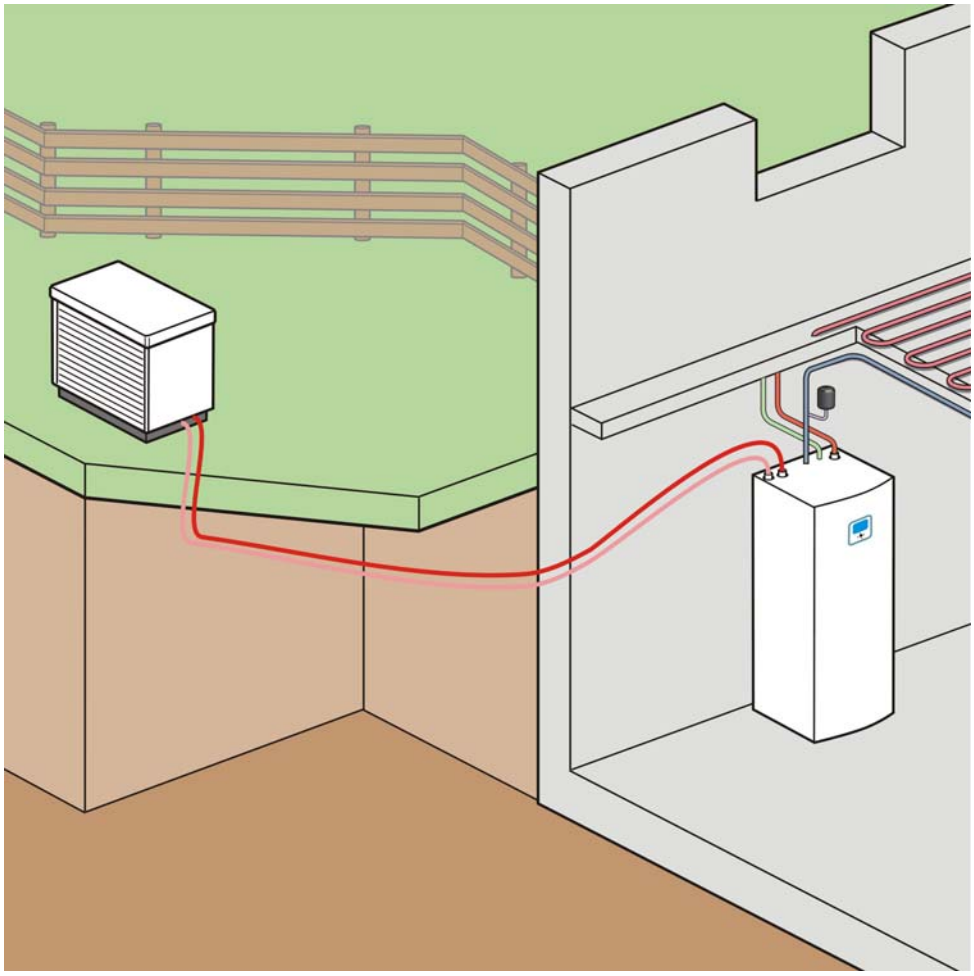
Air to Water Heat Pump

EVI Split Combo Type

Service Manual



Before operation this product, please read the instructions carefully and save this manual for future.

Thank you for choosing our quality product.
Please read this manual carefully before use and follow the instructions to operate the unit in order to prevent damages on the device or injuries to staff.
Specifications are subject to change with product improvements without prior notice. Please refer to the specification sticker on the unit for upgraded specifications.

Heat pumps stand out for their compactness and high performances: operation down to -20'c. They are reversible and can be used for heating and for cooling in summer. They can also be used for fan coil units.
Heat pump has indoor unit and outdoor unit. Outdoor unit is connected to indoor module by copper connective pipe.

The outdoor unit has:
- Air-side heat exchanger with copper pipes and aluminum fins, complete with grid protection.
- Axial fan

The inside unit has:
- Electronic expansion valve
- Water-side shell-tube heat exchanger complete with water-flow-switch.
- Outdoor temperature probe for control and climatic compensation of the water set point (heat curve).
- LCD controller with thermostat function, displaying and setting the operating parameters.
- Electronic control panel equipped with electrical terminal boards for connective external consents.
- Structure in painted galvanised stell complete with condensation tray.
- Compressor: scroll EVI hermetic compressor complete with thermal protection.
- Circulation pump
- Auxiliary electrical heater
- 3-way-water-valve: the motorised reversal valve with connector for sanitary hot water tank

Optional:
- Buffer tank: used to limit operation of the compressor in short cycles and to provide a reserve for the defrosting phase on reversible air/water heat pump.

▌Working temperature range:
- in heating mode:
  Outside air: -20 ~45℃
  Water: +18/+55'c
- in cooling mode :
  Outside air: +15 ~45℃
  Water: +7/+25℃

Maximum operating water pressure: 7bar.

When install the unit, be sure to check whether the selection of installation place, power supply specifications, usage limitation(piping length, height differences between indoor and outdoor units, power supply voltage and etc.) and installation spaces

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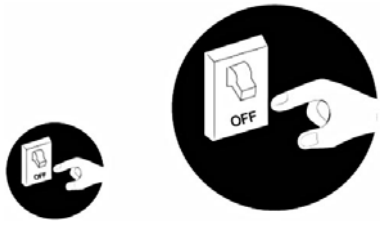
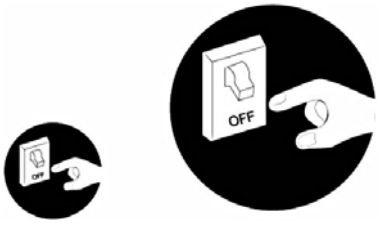
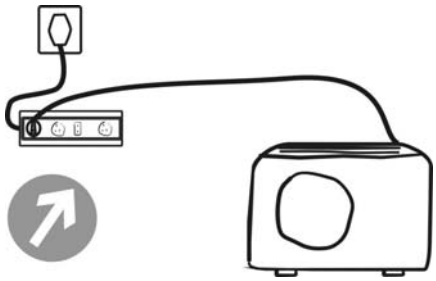
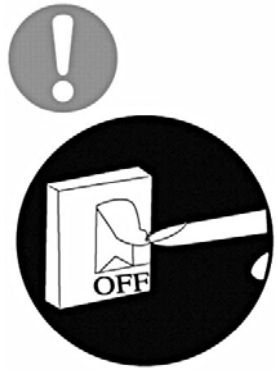
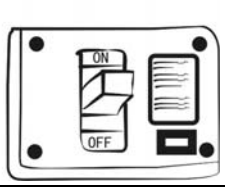
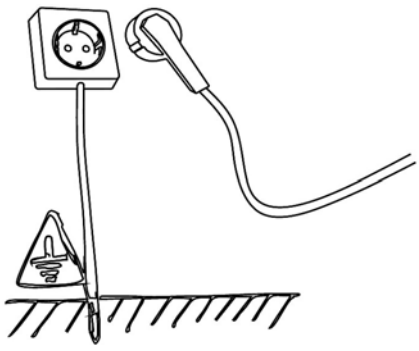
1 Safety precautions

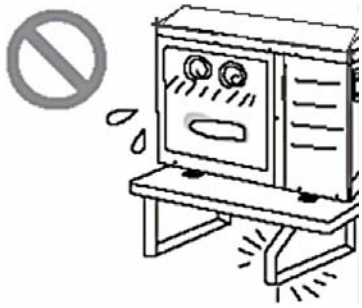
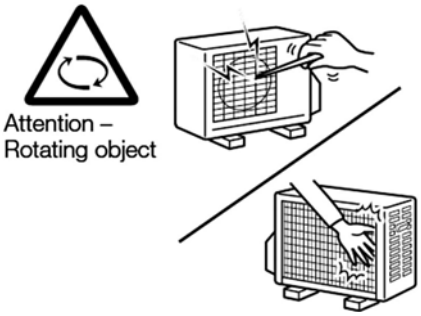
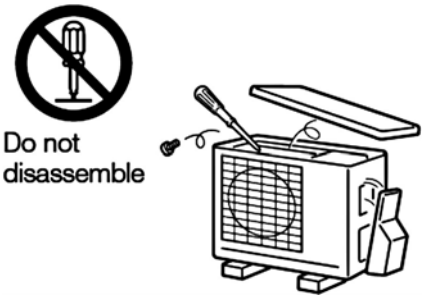
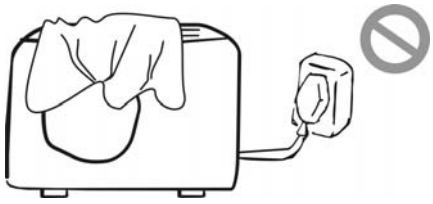
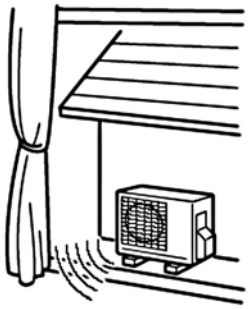
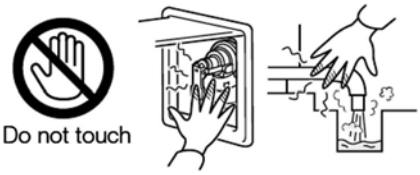
IMPORTANT

If heat pump is not running in the winter, it is necessary to keep power supply connected for Anti-freeze protection. In cold weather (≤ 0℃), if heat pump is no longer needed, do drain out all the water inside the system.

1.1 Safety precautions

- Warning **- suggestion** **- prohibition**

Once abnormality like burning smell occurs, please cut off the power supply immediately and then contact with service center.  **If the abnormality still exists, the unit may be damaged and electric shock or fire may result.**	**Be sure to pull out the power plug and drain the indoor unit and water tank when unit is not in use for a long time. Otherwise, the accumulated dust may cause overheating fire or freeze of water tank or coaxial heater exchanger in winter.**  	**Make sure to use a dedicated power line for the heat pump only. Do not add other appliances to the line.** 
Before installation, please see if the voltage of local place accords with that on nameplate of unit and capacity of power supply, power cord or socket is suitable for input power of this unit.	**Don't operate the unit with wet hand.** **Otherwise, it may cause electric shock.**	**Never damage the electric wire or use the one which is not specified.** **Otherwise, it may cause Overheating or fire.**
Before cleaning please cut off the power supply. Otherwise, it may cause electric shock or damage.  	**The power supply must adopt special circuit with leakage switch and enough capacity. It is mandatory to use a suitable circuit-breaker for the heat pump and make sure the power supply to the heater corresponds to the specifications. Otherwise the unit might be damaged.**  	**The unit must be earthed to avoid any risks caused by insulation defects.** 

Please note whether the installation stand is firm enough or not.  **If damaged, it may cause fall of the unit and injury of people.**	**Never insert any foreign matter into unit to avoid damage. And never insert your hands into the air outlet of outdoor unit.** 	**Don't attempt to repair the unit by yourself.**  **Improper repair may cause electric shock or fire, so you should contact the service center to repair.**
Don't step on the top of the unit or place anything on it. **There is the danger of fall of things or people.**	**Never block the air inlet and outlet of unit.**  **It may reduce efficiency or cause stop of the unit and even fire.**	**Keep pressurized spray, gas holder and so on away from the unit above 1m. It may cause fire or explosion.**
Select an installation place where noise and vibration when operation do not bother your neighbors. 	**Remove any snow from the units after snowfalls.** 	**Make sure no water or other liquid drips into the electric box of the unit Otherwise the unit might be damaged.**
Check the water temperature before supplying any hot water or taking a shower. Could result in being burnt. 	Do not touch the faucet while hot water is being supplied. Could result in being burnt by hot water 	Do not touch the relief valve, drainage pipe, drain outlet or drain elbow when inspecting the relief valve or while draining hot water. 

2 Working principle of a Heat Pump (refrigerant circuit):

The refrigerant system consists of 6 main components:
EVI scroll type compressor, 4-way-valve, heat exchanger (condenser, refrigerant to water), electronic expansion valve, evaporator (air to refrigerant), Economizer.

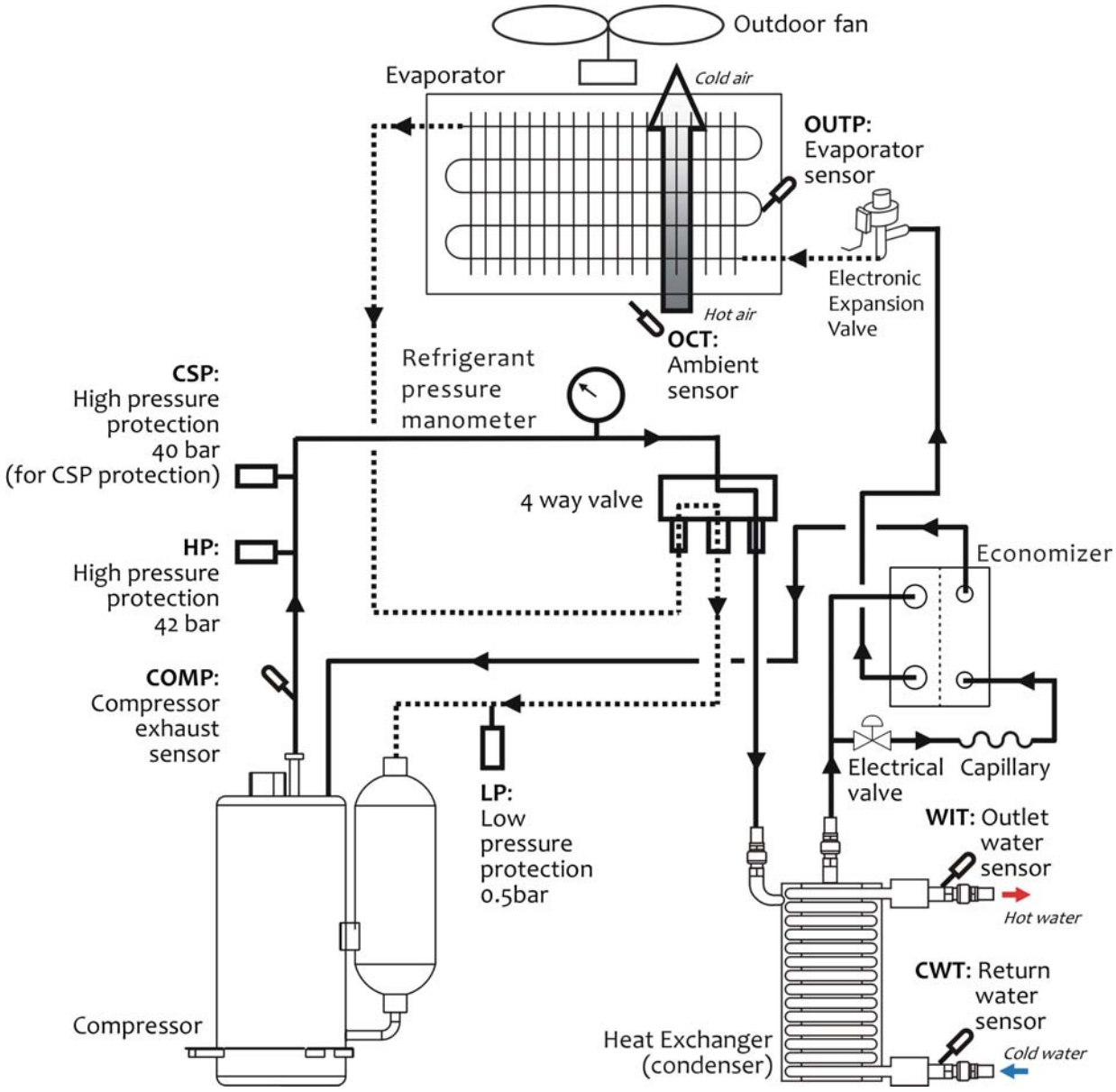
Heat pump can absorb the heating from air source. This makes the heat pump a very environmentally friendly and economically sound alternative for space heating.

*** Evaporator: low temperature, low pressure refrigerant go through evaporator, to boil and turn from liquid to gas.**

*** Compressor: compressor absorb refrigerant, and compress to high temperature, high pressure status.**

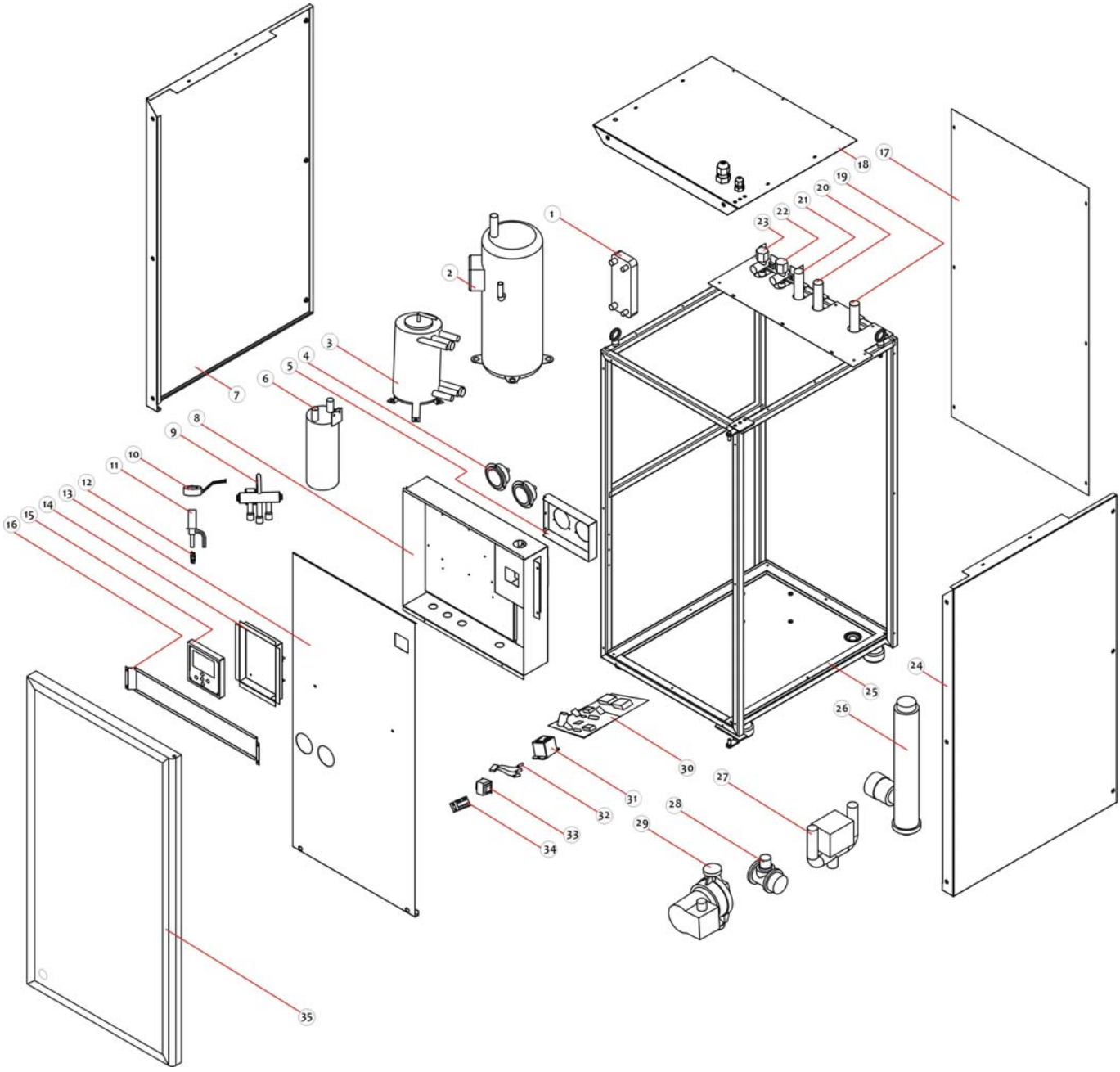
*** Condenser: refrigerant release heat energy to heat exchanger. Refrigerant temperature reduces, and it returns from gas status to liquid status.**
The heat energy is absorbed by water, circulated by a circulation pump to indoor radiator or floor heating systems.

*** EEV: at last the refrigerant go through the electronic expansion valve, where its pressure is reduced, and then continues to the evaporator.**



3 Explored view

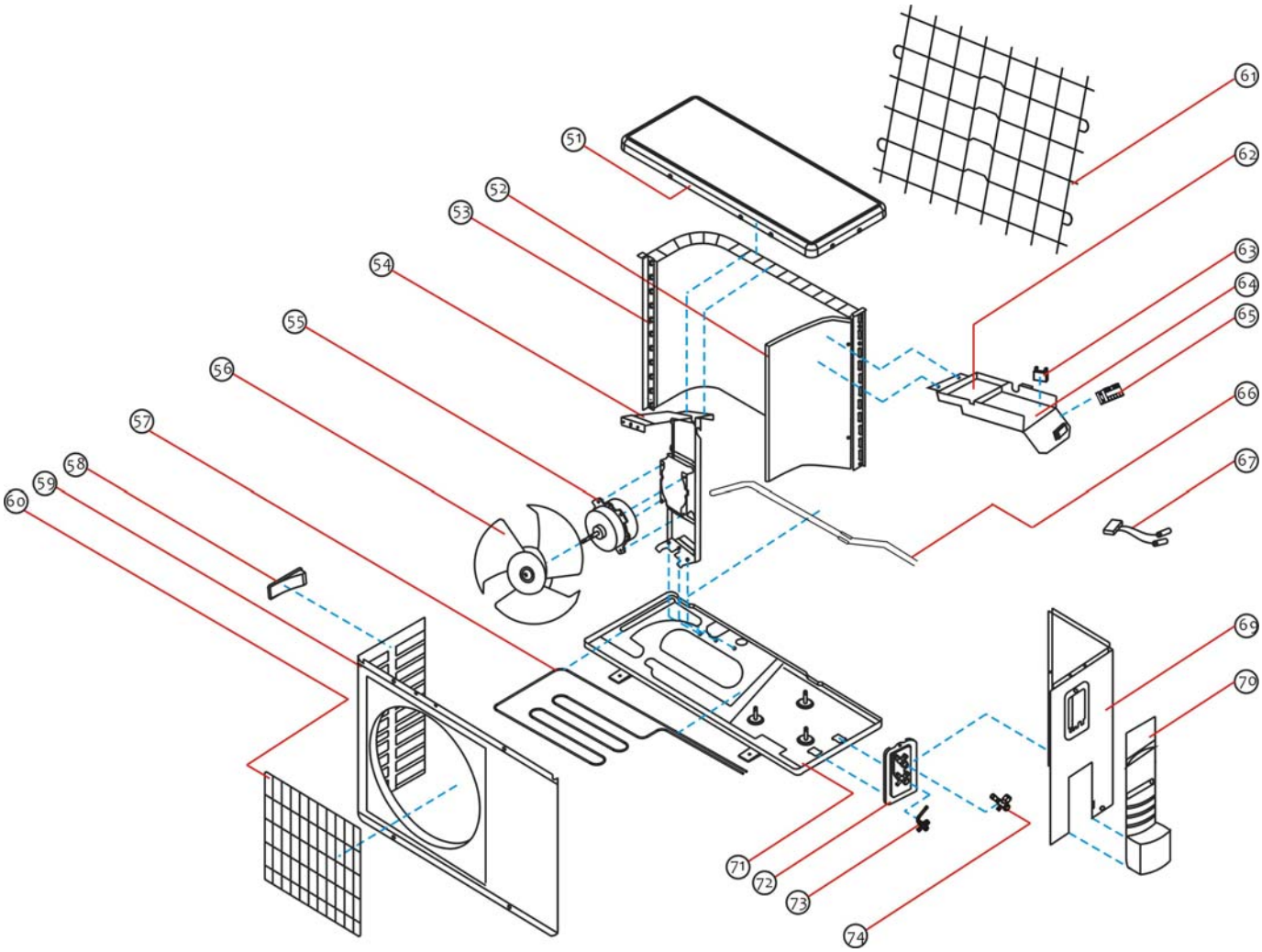
3.1 indoor unit explored view



1	Economizer		15	controller		29	Circulation pump
2	Compressor		16	Controller bracket		30	PCB
3	Heat exchanger (condenser)		17	Return water connector		31	
4	Manometer		18	Top plate		32	Sensor
5	Manometer bracket		19	connector to water tank		33	Transformer
6	Accumulator		20	Connector to house		34	Terminal
7	Left plate		21	Return connector		35	door
8	Electrical control box		22	Gas valve			
9	4-way-valve		23	Liquid valve			
10	Coil for EEV		24	Right plate			
11	Electronic expansion valve		25	Frame			

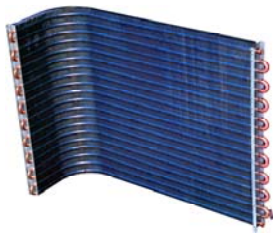
12	**filter**		26	**Electrical heater**			
13	**Front plate**		27	**3-way-water-valve**			
14	**Controller box**		28	**Water-flow-switch**			

3.2 Outdoor unit explored view



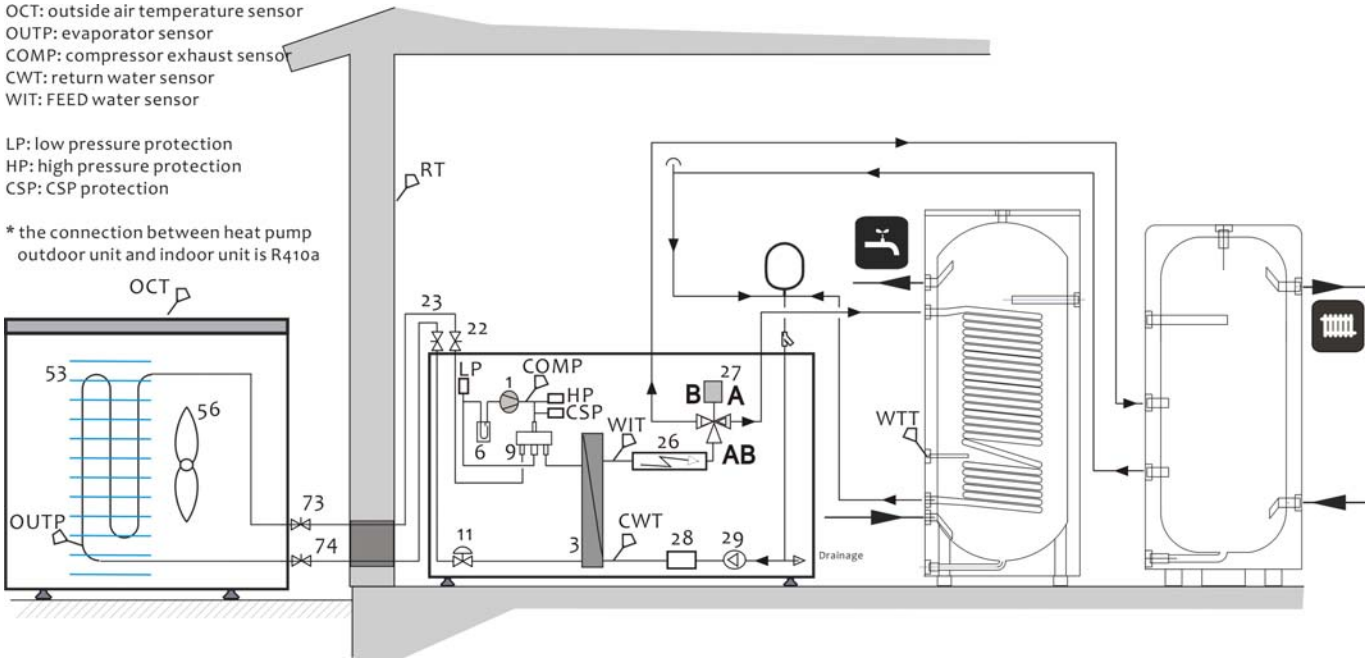
1	Top panel		17	Sensor
2	Separate panel		18	Electronic expansion valve coil
3	Evaporator		19	Electronic expansion valve
4	Motor bracket		20	Filter
5	Motor		21	Right panel
6	Fan blade		22	Right handle
7	Bottom plate heater		23	
8	Left handle		24	Reactance
9	Front panel		25	Copper pipe
10	Plastic net		26	Evaporator bottom heater
11	Near net		27	Compressor
12	SPM module		28	Compressor heater
13	Motor capacitor		29	Gas connector
14	Main circuit board		30	Liquid connector
15	4-way-valve		31	Valve plate
16	4-way-valve coil		32	Bottom plate

3.3 main components

2 compressor	3 Shell tube heat exchanger	 evaporator
Pressure switch	Electronic expansion valve	4-way-valve
Fan blade	Motor	**Switch board**
controller	Main board	**Room temp. sensor / Outside air temp. sensor**
Water tank/return/FEED/ temp. Sensor	3-way-water-valve	Circulation pump
Electrical heater and holder	Water flow switch	

4. Applications

4.1 application: supply sanitary hot water, house heating



Recommended installation order:

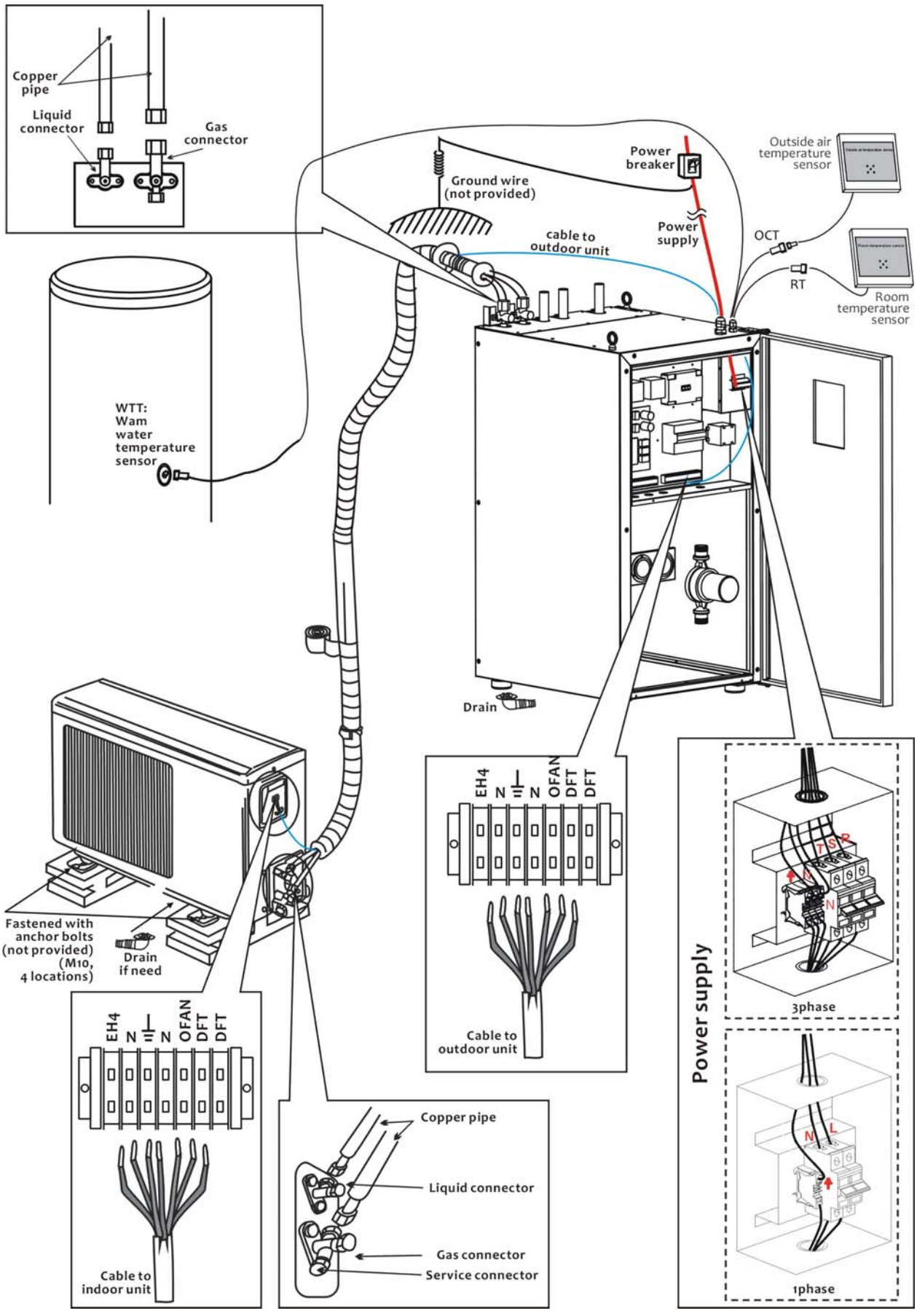
1. Connect copper connective pipe between indoor unit and outdoor unit.
2. Connect indoor unit to the climate system, cold and hot water lines as well as any external heat sources.
3. Connect the load monitor, outdoor temperature sensor; any centralized load control and external contacts as well as the cable between outdoor units. .
4. Connect power supply to outdoor unit. .

Installation requirements

	10kW	12kW	15kW
Max pressure for house heating	5 Bar		
Highest recommended FEED / return temperature at dimensioned outdoor temperature	55/45℃		
Max water outlet temperature with electrical heater	+65℃		
Max FEED line temperature with compressor	+58℃		
Min supply temperature cooling	+7℃		
Max supply temperature cooling	+25℃		
Max water flow for heat pump	0.8l/s	1.1l/s	1.3l/s
Min water flow for heat pump	0.4l/s	0.5l/s	0.6l/s

5. Installation

5.1 installation plan



5.2 Installation Outdoor Unit

Outdoor unit can be transported either vertically or horizontally. However it must be stored vertically and in dry conditions.

5.1.1 Select the Installation Place of Outdoor Unit

*** The outdoor unit should be installed on a solid wall and fastened securely.**

*** The outdoor units should be installed close to the house, on a terrace, on the façade or in a garden. They are designed to operate in the rain but can also be installed under cover as long as there is sufficient ventilation. There should be no obstacles to hinder the free circulation of air to the exchanger inlet and outlet (see installation diagrams below).**

*** The emplacement of the outdoor unit should be carefully chosen and protected from prevailing winds in order for it to be compatible with environmental requirements: integration into the site, noise level.**

*** We particularly recommend:**

- **Not placing the outdoor unit close to sleeping areas**
- **Not placing it opposite a glazed wall**
- **Avoiding proximity to a terrace**

*** Moreover, we recommend positioning the unit above the average depth of snowfall in the region in which it is installed.**

*** It is necessary to provide clearance all around the appliance to carry out connection, commissioning and maintenance operations.**

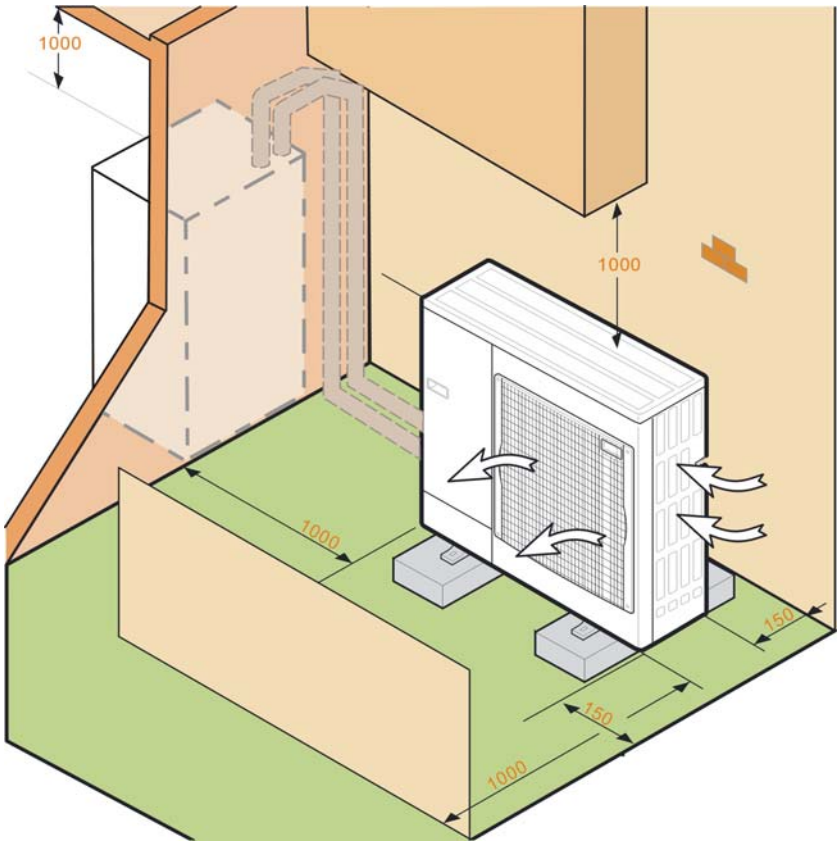
*** The following procedure must be observed before connecting the pipes or electric cables.**

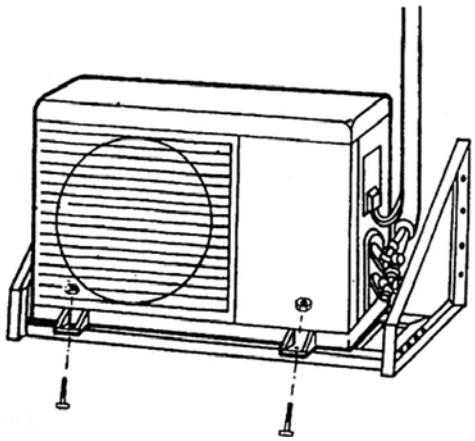
1) Decide which the best position on the wall is and leave enough space to be able to carry out maintenance easily.

2) Fasten the outdoor unit support to the wall using screw anchors which are particularly suited to that type of wall.

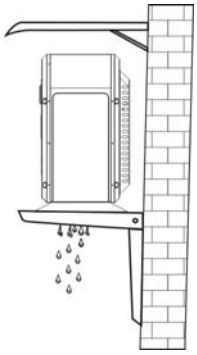
3) Use a larger quantity of screw anchors than normally required for the weight they have to bear: during operation the machine vibrates and Has to remain fastened in the same position for years without the screws becoming loose.

4) Mount the outdoor unit on the support using the four bolts supplied.





*** Please install the drain connector to the unit when necessary. In some cold areas (temperature below 0℃), please don't use the drain connector; otherwise it may clogged by ice.**



5.3 Indoor Unit Installation

***** It is recommended that indoor unit is installed in a room with existing floor drainage, most suitably in a utility room or boiler room.

***** The surface must be firm, preferably a concrete floor or foundation.

***** Install indoor unit with its back to an outside wall, ideally in a room where noise does not matter. If this is not possible, avoid placing it against a wall behind a bedroom or other room where noise may be a problem.

***** The unit can be aligned using the adjustable feet.

***** Route pipes so they are not fixed to an internal wall that backs on to a bedroom or living room.

***** Ensure that there is approx. 500 mm free space in front of and 220 mm above the product for any future service.

Dimensioning expansion tank

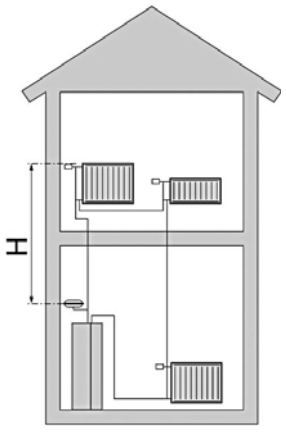
The expansion tank's volume must be at least 5 % of the total volume.

Example table

Total volume (l)	Volume Expansion tank (l)
280	14
320	16
360	18

Initial pressure and max height difference

The initial pressure of the pressure expansion tank must be dimensioned according to the maximum height (H) between the tank and the highest positioned radiator, see figure. An initial pressure of 0.5 bars means a maximum permitted height difference of 5 m.
If the standard initial pressure in the pressure tank is not high enough it can be increased by filling via the valve in the expansion tank.
Any change in the initial pressure affects the ability of the expansion tank to handle the expansion of the water.



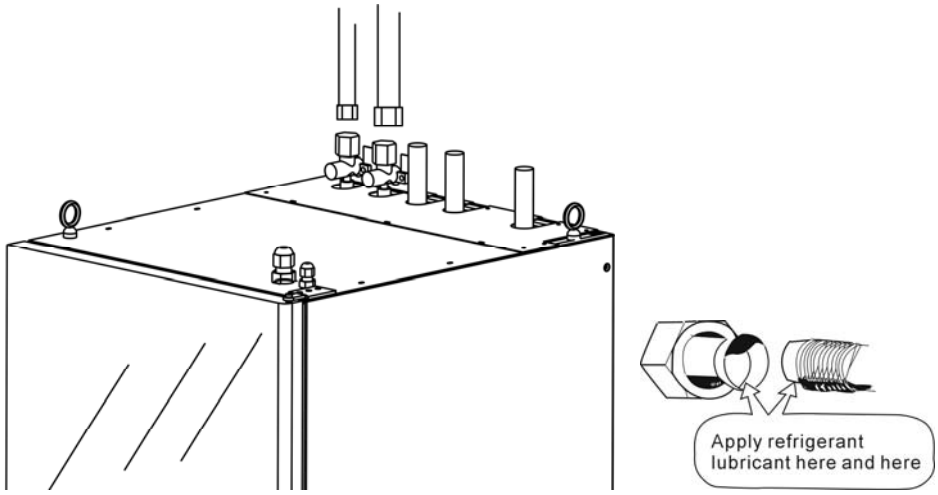
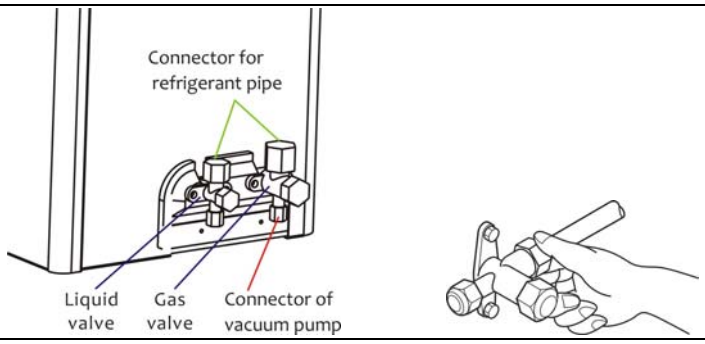
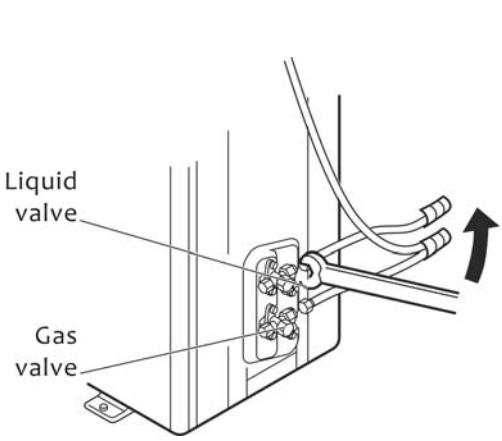
5.5 Refrigeration Connection

5.5.1 Refrigeration connection

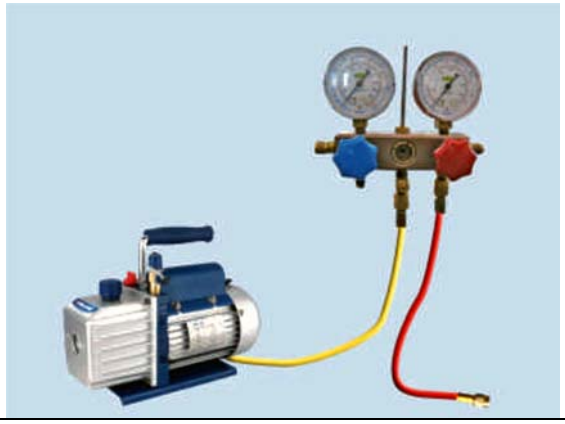
The commissioning of heat pump includes operations on the refrigeration circuit. Appliances must be installed, commissioned, maintained and repaired by qualified, authorized personnel, pursuant to the requirements of prevailing directives, laws and regulations and in accordance with the codes of practice of the profession.

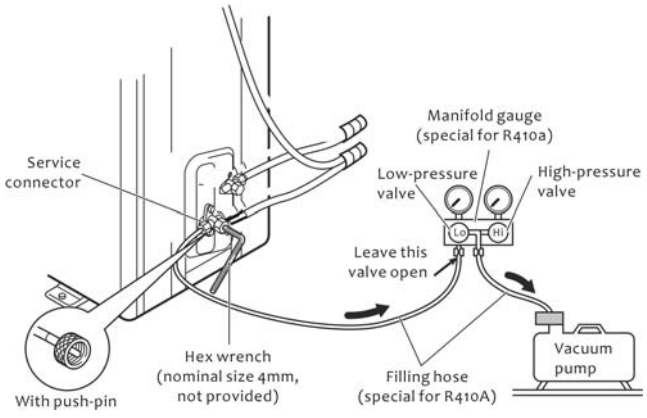
*** Before shipped out from manufacturer, the indoor unit has been filled with refrigerant. Additional refrigerant may be filled when copper pipe is more than 5 meters. Outdoor unit do not have refrigerant inside.**
*** Check the liquid valve and the gas valve of the outdoor unit. The valves shall be completely shut off.**

5.5.3 Refrigeration connection step

1. Connect the copper pipe to indoor unit.	
2. Wipe the quick connectors with clean cloth to prohibit dust and impurity entering the pipes. **Align the centre of the pipe and fully screw in the angular nuts with Finger.** **connect other side of copper pipe to outdoor unit**	 

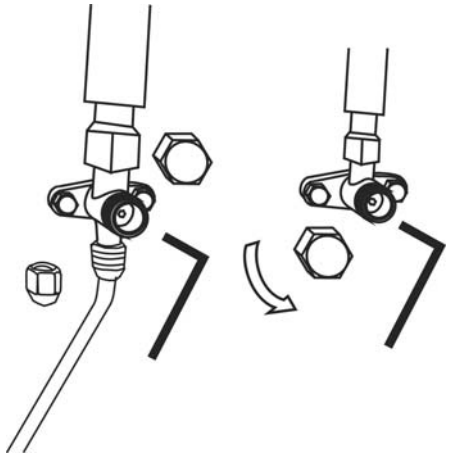
4. A vacuum pump and manifold gauge are needed.
Connect the pressure gauge to the vacuum pump.
Use Vacuum pump to remove the air from outdoor unit and copper pipe.



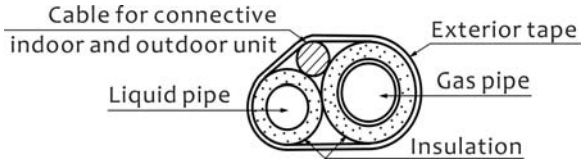


5. When vacuuming the outdoor unit and copper pipe, please turn on gas/liquid valve on outdoor unit ; but do not turn on gas/liquid valve on indoor unit, otherwise refrigerant leakage. Vacuum the unit for at least 15 minutes till negative value shown on the pressure gauge, and close the manifold gauge.

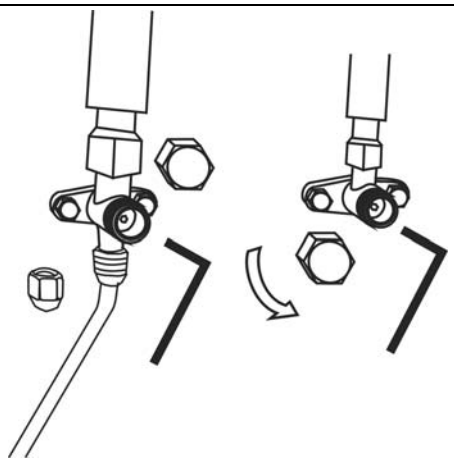
6. Use a 4mm hex wrench to open two valves of outdoor unit.



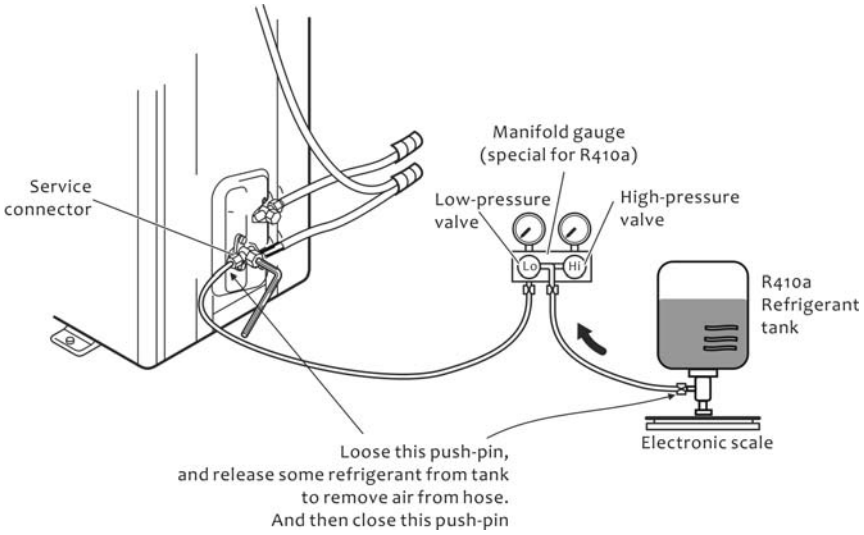
7. Remove the service pipe of pressure gauge. Put copper nut back. Tighten them with a wrench.
Connect the electric cable as per wiring diagram, and bundle it with the connecting pipe.



6. Use a 4mm hex wrench to open two valves of outdoor unit.



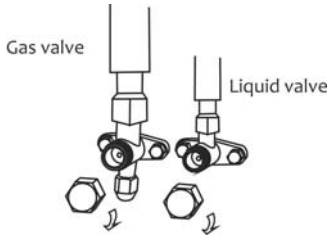
8. After confirming that there is no leakage from the system, when the compressor is not in operation, charge additional R410a refrigerant with specified amount to the unit through the service connector on liquid valve.
Be sure to charge the specified amount of refrigerant in liquid state to the liquid pipe. Since R410a is a mixed refrigerant, adding it in gas form may cause the refrigerant composition to change, preventing normal operation.


Service connector
Manifold gauge (special for R410a)
Low-pressure valve
High-pressure valve
Lo
HI
R410a Refrigerant tank
Electronic scale
Loose this push-pin, and release some refrigerant from tank to remove air from hose. And then close this push-pin

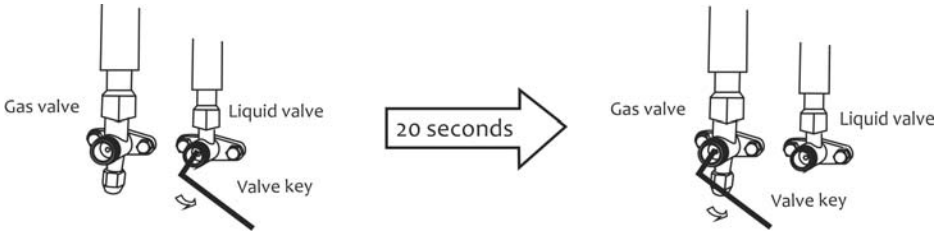
5.5.4 Return refrigeration

If heat pump want to disconnect. Please return refrigerant R410a from outdoor unit back to indoor unit as following:
Run heat pump on ROOMCOOL operation mode.
4-way-valve switch ON, circulation pump switch ON, compressor start, fan start.

1. Remove the cap of two valves on indoor unit with the spanner.

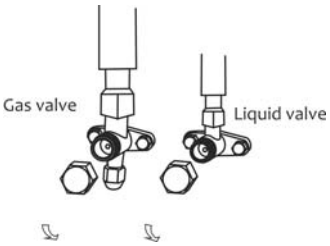


2. Tighten the core of the liquid valve (the smaller one) with valve key at first. After about 20 seconds, you can hear a special sound from compressor; tighten the core of the gas (the bigger one) with valve key.

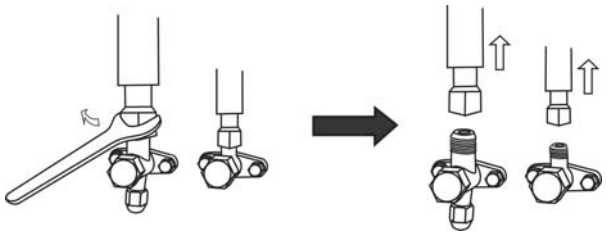


3. Press **to stop heat pump**.

4. Tighten the cap of two valves.



6. Loose the nut of the connect pipe to the outdoor unit valve with 2 spanner, disconnect the connect pipe and the two valves.



5.5.2 Maximum distances and quantity of refrigerant fluid to be loaded

	5kW	7kW	10kW	12kW	15kW	18kW
Ø gas pipe	**1/2 "**	**5/8"**	**5/8"**	**3/4"**	**3/4"**	**3/4"**
Ø liquid pipe	**1/4 "**	**3/8"**	**3/8"**	**1/2"**	**1/2"**	**1/2"**
max pipe length	**20 m**	**20 m**	**20 m**	**20 m**	**20 m**	**20 m**

IMPORTANT

The refrigerant R410a inside heat pump is suitable for 5 meter copper pipe. If the refrigerant link between outdoor unit and indoor unit is more than 5 meter,
Please fill 10g per meter for 5kW, 7kW; 30g per meter for 9kW, 12kW, 15kW, 18kW.

5.6 Electrical connection

IMPORTANT

Electrical installation and service must be carried out under the supervision of a qualified electrician. Electrical installation and wiring must be carried out in accordance with the stipulations in force: maximum amperage on the outdoor unit (thermodynamic unit). See the table below, distance of the appliance from the original power supply, upstream protection, and neutral operating conditions.

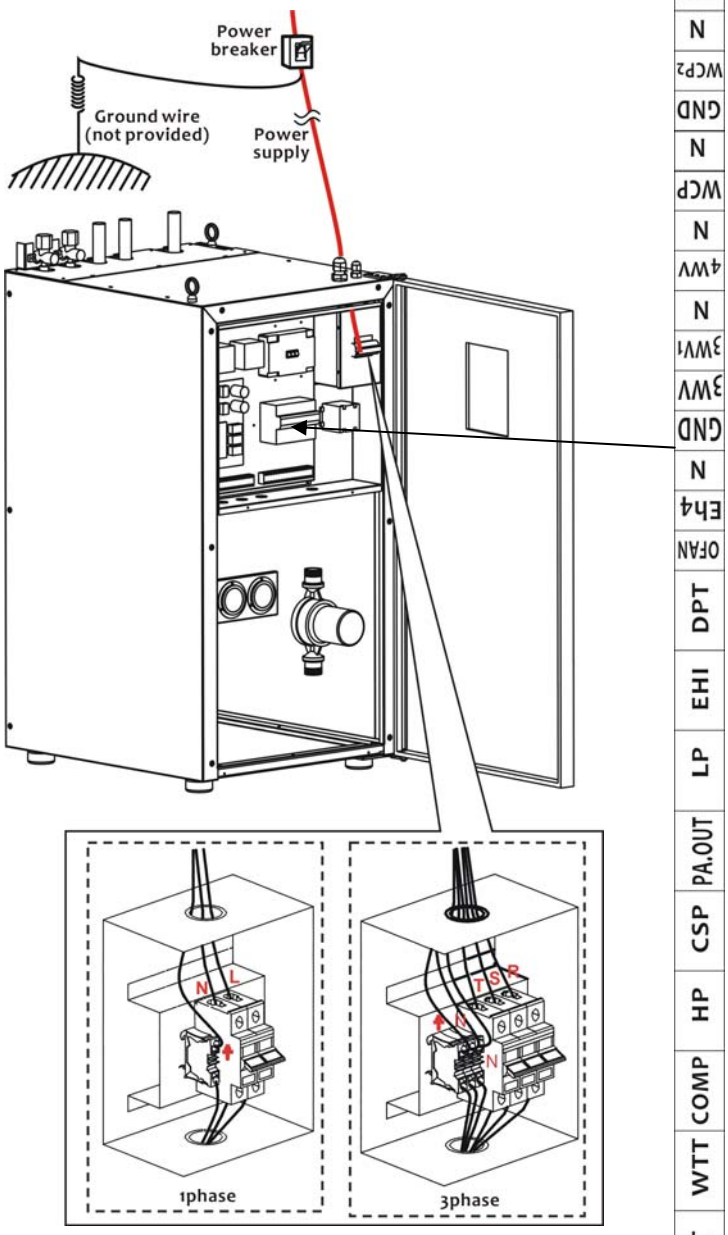
1.It is recommended to use a suitable breaker for the heat pump and make sure the power supply to the heater Corresponds to the specifications. Otherwise the unit might be damaged.

2.The power supply to the heat pump unit must be grounded.

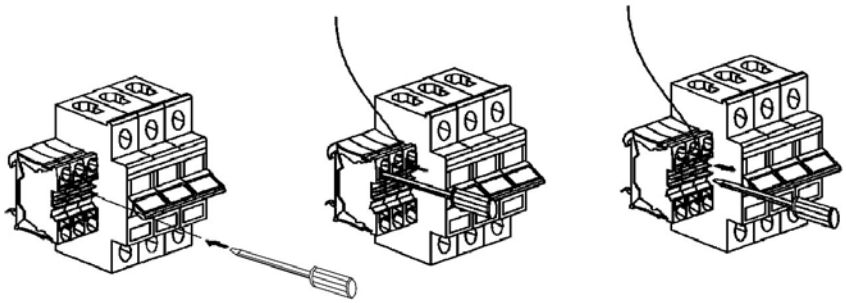
3.Cable should be fixed tightly, to ensure it won't get loosen.

Connecting power supply

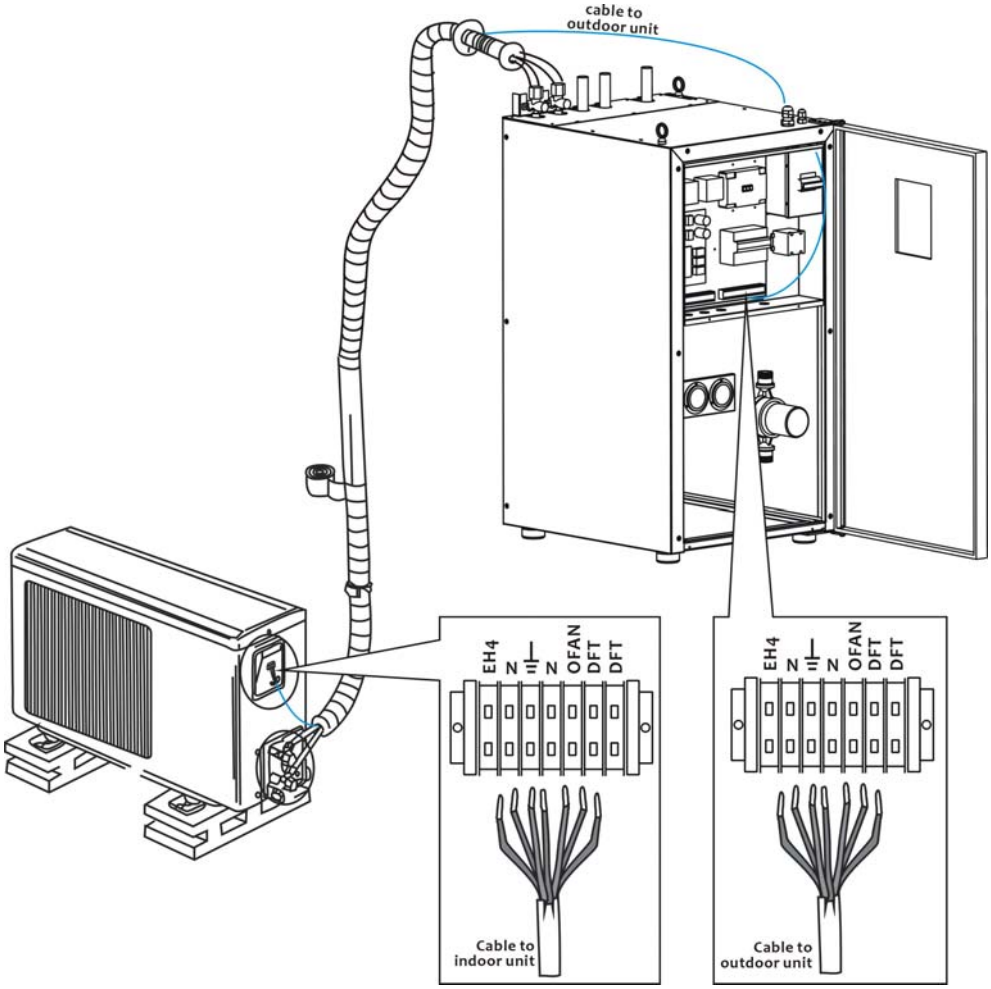
Incoming power supply cable is connected to terminal block from top cable clamp. The cable must be dimensioned according to the applicable norms.



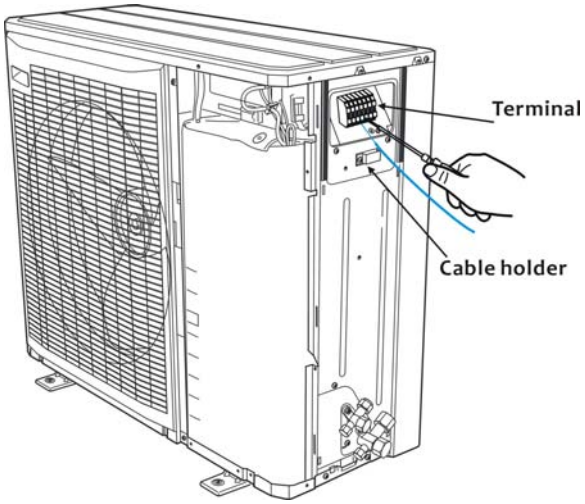
Connect the power cable as following:



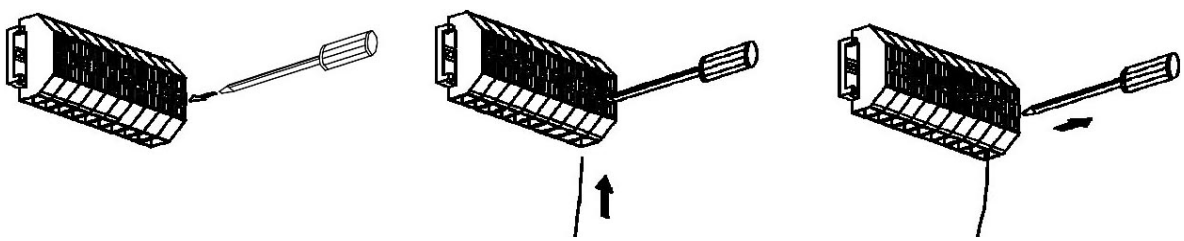
Connecting signal supply from indoor unit to outdoor unit



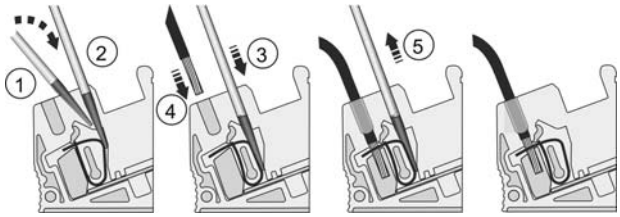
Connect cable on outdoor unit



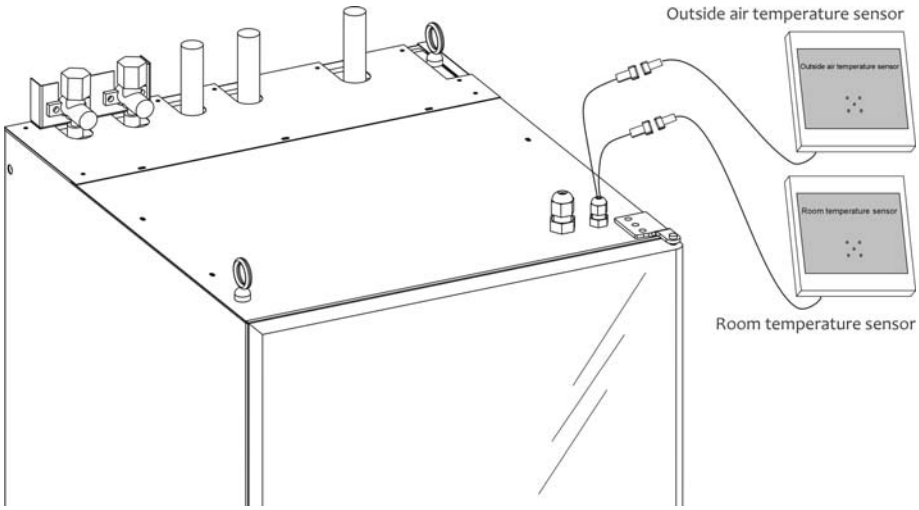
Connect cable on indoor unit



When the cable is connected to terminal, a screwdriver is used to open the terminal, see figure :



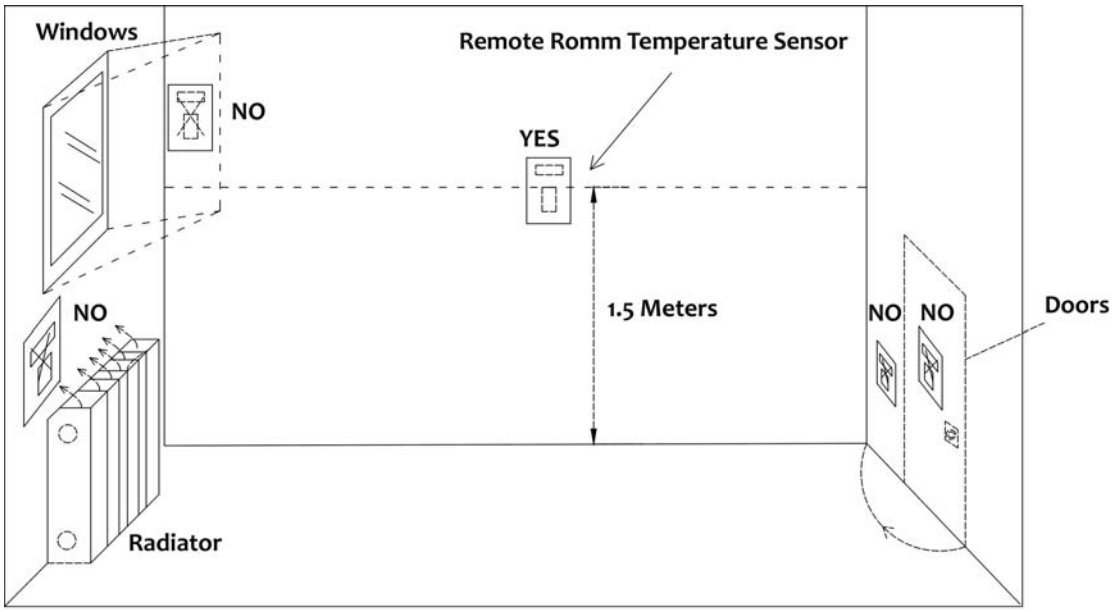
Connect room/outdoor temperature sensor



5.4 Room temperature sensor installation

When customer choose fan coil mode, he should install the room temperature senor as following:

1. Take the room temperature sensor out from the indoor unit.



2. Distance between the indoor unit and the remote room temperature senor should be less than 15 meter due to length of the connection c able of remote air temperature sensor.
3. Height from floor is approximately 1.5 meter;
4. Remote room temperature sensor can not be located where the area may be hidden when door is open;
5. Remote room temperature sensor can not be located where external thermal influence may be applied;
6. Remote room temperature sensor should be installed where space heating is mainly applied;

5.7 Pipe connection

5.7.1 General

Pipe installation must be carried out in accordance with current norms and directives. Heat pump can operate with a return temperature of up to 50°C and outgoing temperature from the unit of 55°C.
Heat pump is not equipped with shut off valves; these must be installed outside the heat pump to facilitate any future servicing.
Heat pump can be connected to the radiator system, floor heating system and/or fan coil units.
Install the safety valve and manometer.

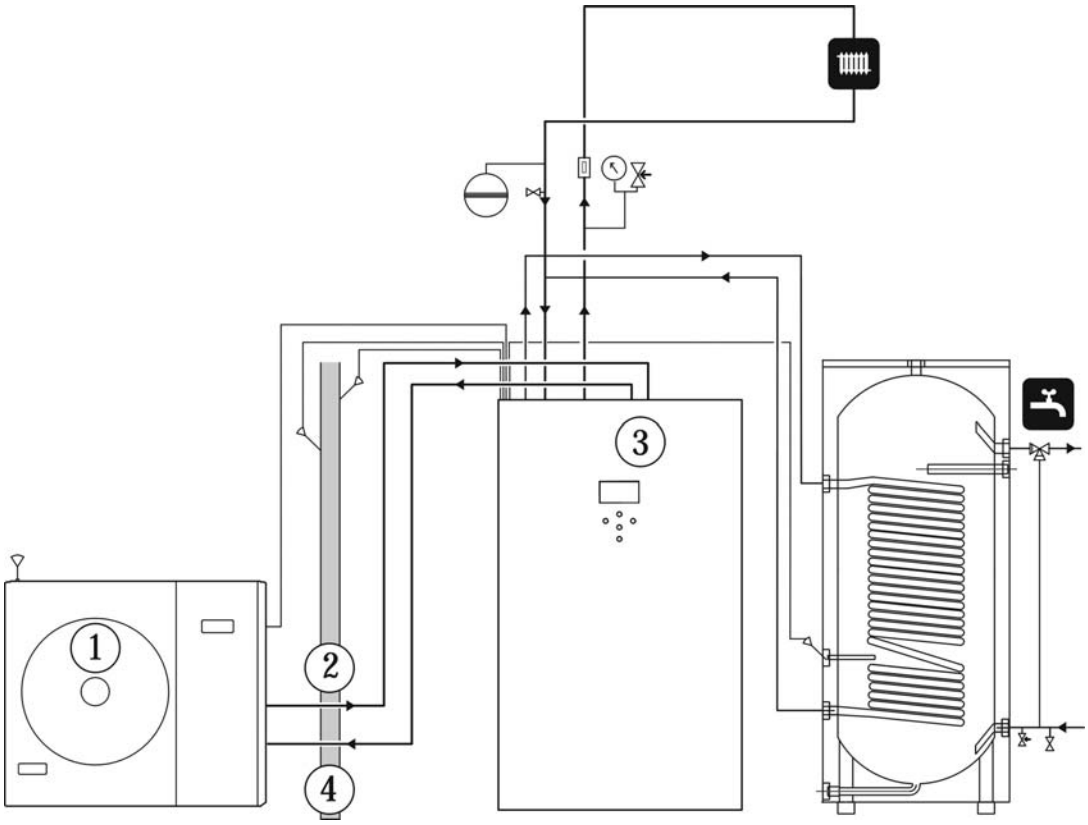
Indoor module is equipped with circulation pump, water-flow-switch, 3-way-water-vave, electrical heater backup.

Note: this heat pump is split type with refrigeration link between outdoor unit and indoor module, it is not necessary to add glycol to the installation.

Buffer tank:
The installation of buffer tank is recommended for installations.
It is intended:

- Increase the water volume in an installation in order to limit the short-cycle operation of the compressor. The greater the water volume, the lower the number of start-ups of the compressor and the longer its useful life.
- Guarantee on energy reserve for the defrosting phases.

Example of heat pump installations
- Heat pump split compact - DHW production by independent tank - Buffer tank for house heating



Connection of extra circulation pump

When connecting additional circulation pump, to achieve a higher flow capacity, see alternative "Underfloor heating systems" on page 25. Respective maximum flows must not be exceeded.

Connecting the hot water tank

The water tank must be supplied with necessary set of valves.

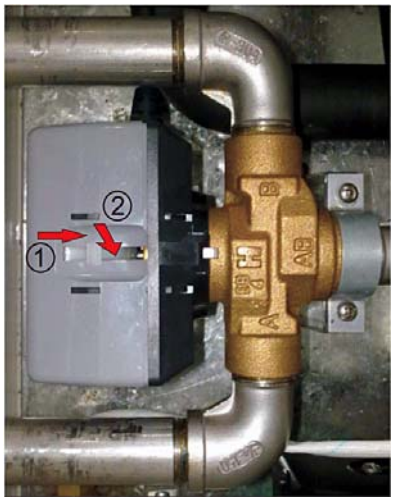
* There must be a mixing valve if the temperature exceeds 60 °C.

* The safety valve must have a maximum 10.0 bar opening pressure and be installed on the incoming domestic water line according to outline diagram. The entire length of the overflow water pipe from the safety valves must be inclined to prevent water pockets and must also be frost proof.

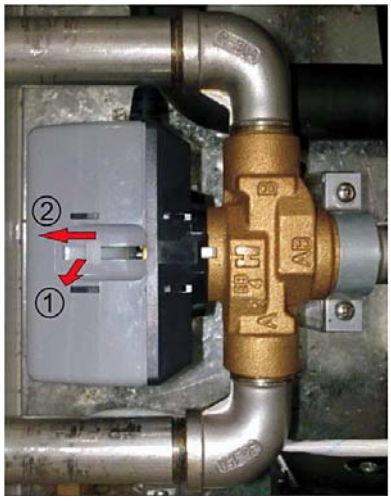
* See section Dockings on page 23 for outline diagram.

5.7.2 Filling and venting the heating medium system

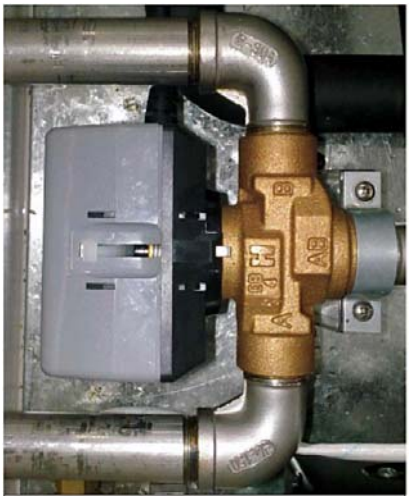
1. Check the water system for leakage.
2. Connect the filling pump and return line on the heating system's service connections as shown in figure.
3. Close the valve between the service connections.
4. Open the valves on the service connections (AV1, AV2).
5. Pushing the white manual lever down to bottom. (This has already been done when the machine leaves factory), then three way valve's water tank port is closed (the "B" port), room heat port is open (the "A" port).
6. Start the filling pump, and fill until there is fluid in the return pipe.
7. Open up Power ON from control panel to start machine, then heat medium water pump is running, the valve will return to the up position when power is restored.
8. Firmly pushing the white manual lever down to midway and in. in this position both the 'A' and 'B' ports are open.
9. The filling pump and the heating medium pump are now operational. The fluid should circulate via the container with tap water until it emerges from the return hose without being mixed with air.
10. Stop machine, heat medium water pump stop running. Depressing the white manual lever lightly and then pulling the lever out, pushing the while manual lever down to bottom position, and then "A" port open, "B" port is closed.
11. Stop the filling pump and clean the particle filter.
12. Start the filling pump; open the valve between the service connections.
13. Close the valve on the service connection's return line. Now pressurize the system (to max 3 bars) with the filling pump.
14. Close the valve (AV2) on the service connection.
15. Stop the filling pump.
16. Select the auto operating mode using the operating mode button.



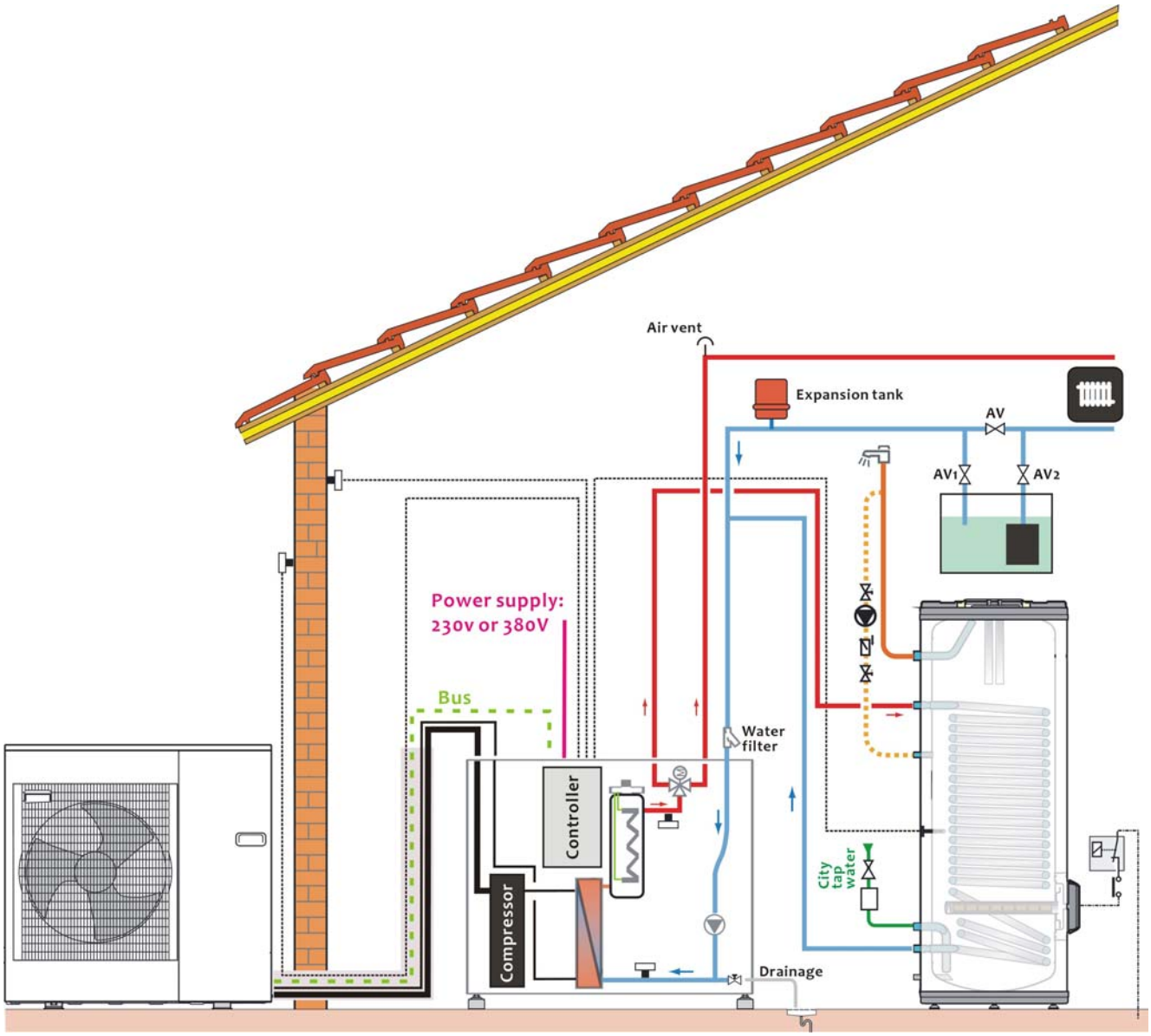
Push the white gear onto the position of middle, and then use your thumb to press it inside, this time both port A and port B are in open state.



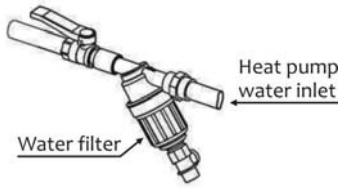
Please use screwdriver to unclench the white gear of the three way valve.



Then the white fear will move back to the original position. The three way valve will turn to port B automatically.



A mesh filter must be installed in front of the water inlet of the unit and water tank, for keeping the water quality and collecting impurity contained in the water. Take care to keep the water filter mesh towards the bottom. Check valve is recommended to be installed at both sides of the filter, so as to clean or change the filter in an easier way.

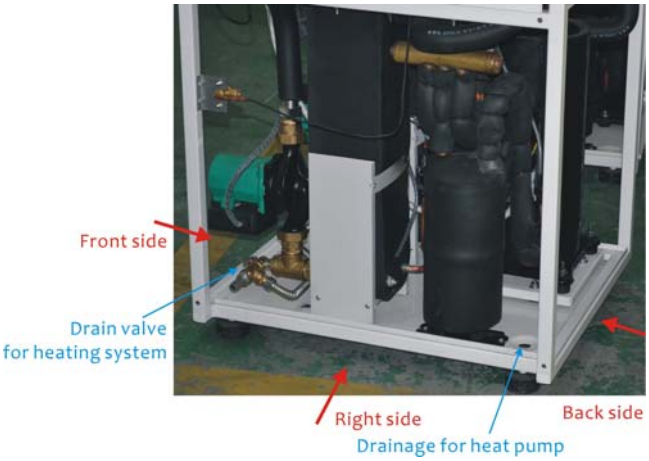


5.7.3 Drainage

1) drain of heating system

Close the shut-off valves in heating medium system. Open the drain valve. A small amount of water runs out.

2) drain chassis of heat pump



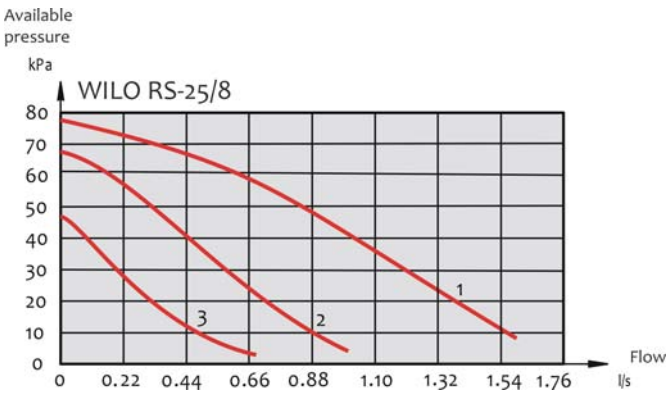
5.74 Circulation pump capacity diagram on heating medium side

Adjustment, charge flow

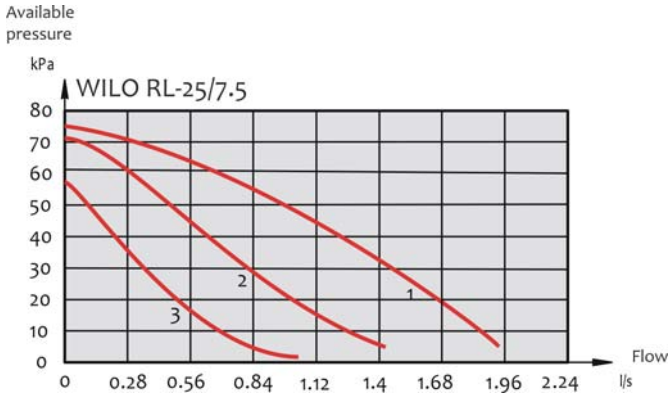
Adjusting the temperature difference (ΔT) between the flow temperature and the return temperature during hot water charging or at high load.

This is easily done by using the temperatures measured in Channel T2 (flow temperature) less Channel T3 (return temperature), this temperature difference (ΔT) is adjusted using circulation pump. Adjustment is performed with stable operation about 5 minutes after start, or about 5 minutes after defrosting with a cold outdoor temperature. The temperature difference must be less than 5'c.

10kW, 12kW



15kW, 18kW



Adjust water flow

WILO RS-25/6

Circulation pump adjust water flow: 1,2, 3 step

WILO RS-25/8

Circulation pump adjust water flow: 1,2, 3 step

WILO RL-25/7.5

Circulation pump adjust water flow: 1,2, 3 step

6 switch board

When install or maintain heat pump, compressor, hot water pump and outdoor fan motor can be start forcibly by switch board.

Ao 1: control compressor

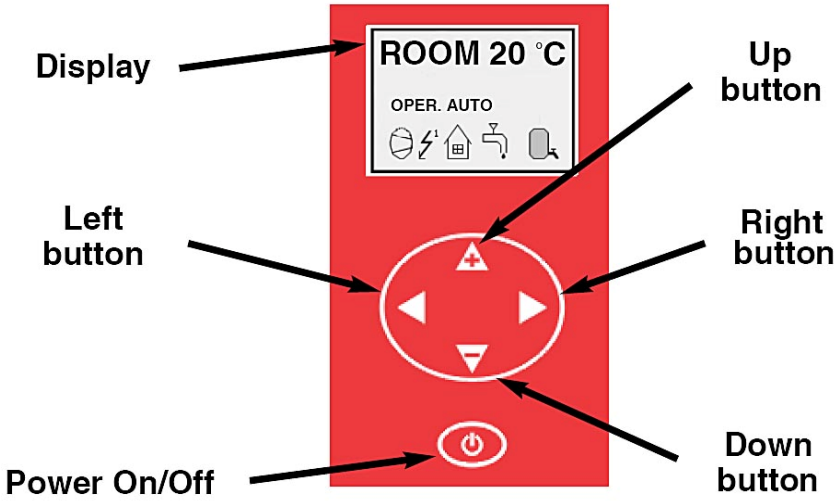
AA M: control hot water pump

BA M: control outdoor fan motor

After testing, switch board will set OFF.

6 Control panel

6.1 description of control panel



To be able to select the desired menu and increase or reduce preset values, you will use the five buttons.

- **Up button with a plus**
- **Down button with a minus**
- **right button**
- **left button**
- **Power ON/OFF button**

8.2 Symbols

	Heat pump is running.		Warm water mode is activated.
1	Electrical heater is activated. The figure indicates capacity step.		Empty symbol, indicates warm Water temperature sensor is less than setting temperature.
	House heat/cool mode is activated.		Full symbol, indicates warm water temperature reach to setting temperature.

8.3 General information

8.3.1 Menu Navigation

Press to next menu or select parameter. Press to previous menu. Press and to navigate parameters of a menu.

A cursor (arrow) on the left-hand side of the display indicates which menu can be opened. Press and also to increase or reduce parameter value.

8.3.2 Display of current operating mode

During normal operation, the screen will display following information:

- Current room temperature : 18°c
- Heat pump operation mode: OFF (heat pump stop)

Press to start/stop heat pump.

If heat pump set OPERATION OFF mode for long time during winter, please remember to remove out all the water the heating system to avoid any damage caused by freezing.

- Which day of the week, clock
- Current activated operation mode

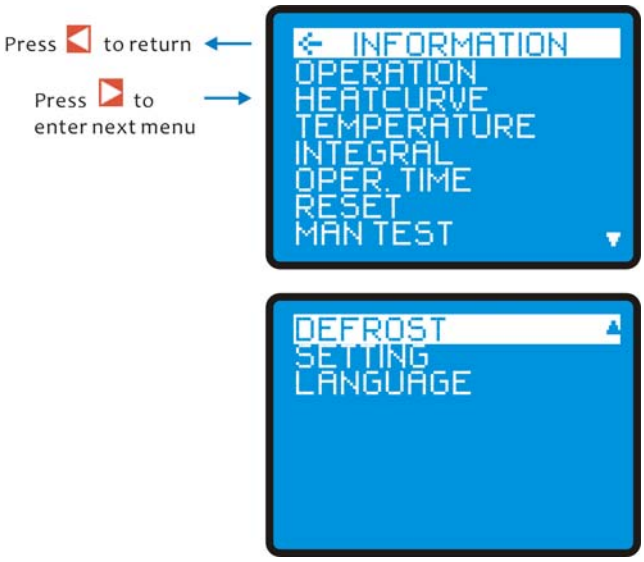
8.4 Menus

84.1 main-menu INFORMATION

Press or to main-menu INFORMATION.

Press and to navigate sub-menu.

Press enter to sub-menu.



84.2 Sub-Menu OPERATION

This menu is used to select operation modes:

- **ROOMCOOL :**
- **ROOMHEAT1 : (heat curve)**
  FEED setting water temperature will change according to outside air temperature. The screen will display "OPER. ROOMHEAT1 ". HEATCURVE can change by CURVE value, ROOM value, part HEATCURVE. Heat pump (compressor, electrical heater) run/stop according to Calculation Integral.
- **ROOMHEAT2:**
  FEED setting water temperature is fixed. The screen will display "OPER. ROOMHEAT2 ". Heat pump run/stop according to setting FEED.
- **WARMWATER :**
  Warm water mode activate or inactivate. The screen will display "OPER. WARMWATER ".

- **Select HEAT PUMP ON/OFF: heat pump activate or inactivate.**
- **Select ADD. HEAT ON/OFF: The electrical heater activate or inactivate.**

If you want to change operation mode:

a. **Press** **to main menu INFORMATION. Press** **and** **to navigate to sub-menu OPERATION.**

b. **Press** **to enter sub-menu OPERATION. Press** **and** **to navigate to desired mode.**

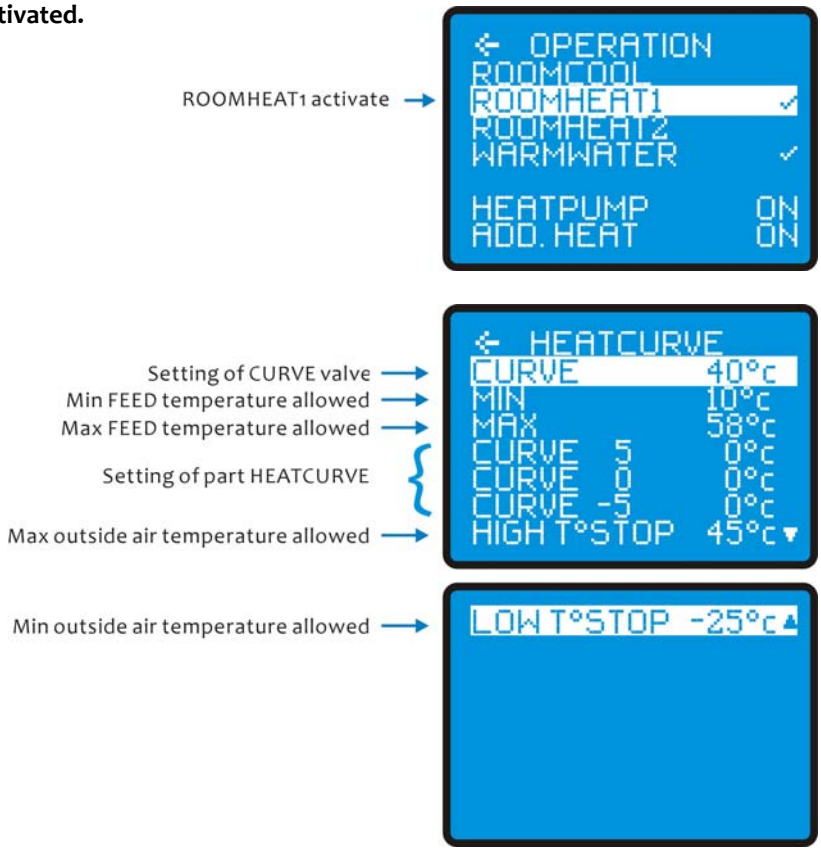
c. **Press** **to select or cancel. The symbol** **display or disappear.**

d. **Press** **to exit setting. And press** **to the top OPERATION, and press** **to back to main menu.**

8.4.3 Sub-Menu HEAT CURVE

This menu is used to set parameter of heat curve for operation mode ROOMHEAT1.

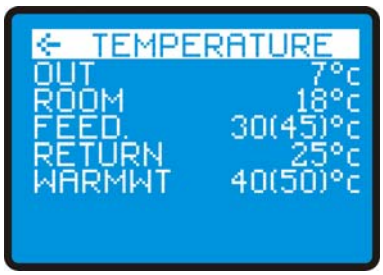
Operation mode ROOMHEAT1 should be activated.



Menu Text	Description	Adjustable by
CURVE	FEED setting water temperature when the outside air temperature is 0°C	User
MIN	Min FEED temperature allowed.	User
MAX	Max FEED temperature allowed.	User
CURVE 5	Part HEATCURVE 5 when outside air temperature is +5°C.	User
CURVE 0	Part HEATCURVE 0 when outside air temperature is 0°C.	User
CURVE – 5	Part HEATCURVE -5 when outside air temperature is -5°C.	User
HIGH T°STOP	Heat pump stops when outside air temperature ≥ value on right.	User, if require
LOW T°STOP	Heat pump stops when outside air temperature ≤ value on right.	User, if require

8.4.3 Sub-Menu TEMPERATURE

This menu shows temperatures of sensor.

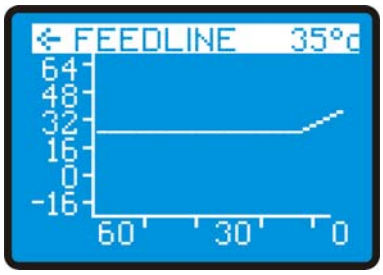


Menu Text	Description	Adjustable by
OUT	Outside air temperature	-------
ROOM	Room temperature. And set ROOM value in HEATROOM1.	Installation contractor. To be adapted to each individual unit
FEED	supply line temperature of heating system; In brackets is set point value in HEATROOM2. In brackets is setting FEED value according to OUT in HEATROOM1	Installation contractor. To be adapted to each individual unit
RETURN	Return temperature of heating system.	Not adjustable.
WARMWT	Warm water temperature in water tank; In brackets is the setting temperature for warm water.	Installation contractor. To be adapted to each individual unit

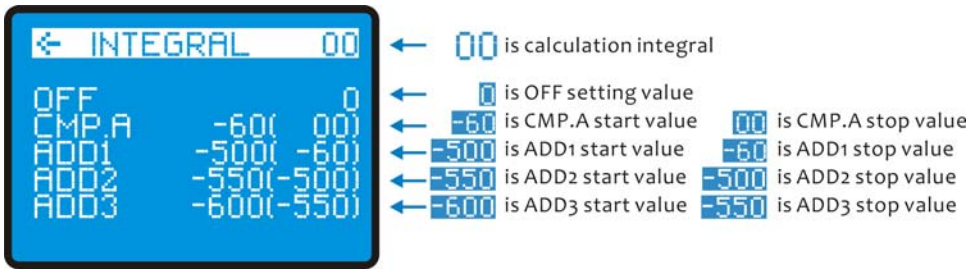
All temperatures change from last 60 minutes is stored in PCB and some temperatures can be viewed in curve.

Press following temperature 3 second to see history curve.

* FEED
* RETURN
* WARMWT



8.4.5 Sub-Menu INTEGRAL



Electrical heater has three steps (2.5kW + 2.5kW + 2.5kW).

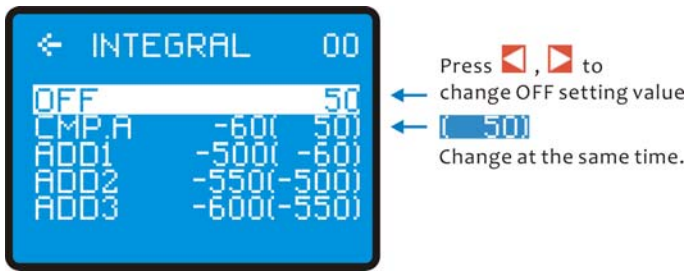
Menu Text	Description	Adjustable by
OFF	When calculation integral ≥ OFF (setting value), heat pump stop.	USER
CMP.A	When calculation integral < CMP.A (start value), compressor start. And calculation integral ≥ OFF (stop valve), compressor stop.	USER
ADD1	When calculation integral < ADD1 (start value), electrical heater 1 start. And calculation integral ≥ CMP.A (stop value), electrical heater 1 stop.	USER
ADD2	When calculation integral < ADD2 (start value), electrical heater 2 start. And calculation integral ≥ ADD1 (stop value), electrical heater 2 stop.	USER
ADD3	When calculation integral < ADD3 (start value), electrical heater 3 start. And calculation integral ≥ ADD2 (stop value), electrical heater 3 stop.	USER

The relation between those parameter is: OFF > CMP.A > ADD1 > ADD2 > ADD3

a. on sub-menu INTEGRAL.

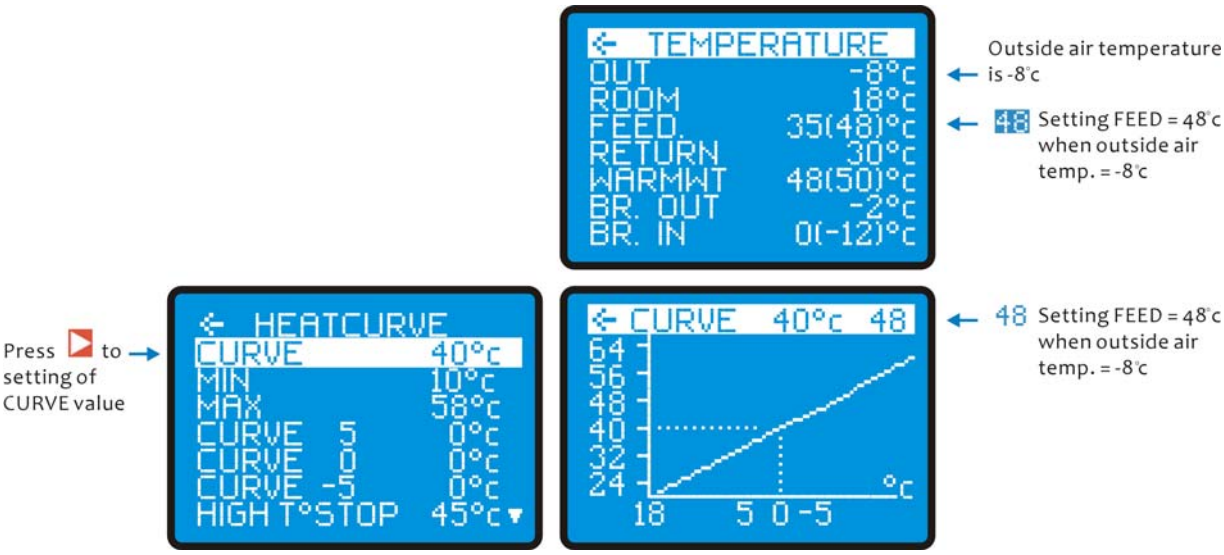
Press and to navigate to OFF.

b. Press to enter OFF setting. Press and to change setting value, each press is 10.



8.4.5.1 Calculation Integral (CI)

CI = (current FEED – setting FEED) * 1 minute



CI	Corresponding valve
...	...
-11 ~ -20	-20
-1 ~ -10	-10
1 ~ 10	10
11 ~ 20	20
...	...

1) FEED is less than setting FEED

For example, outside air temperature = -8 °C, setting FEED = 48°C. PCB will calculate CI every 1 minute.

Compressor start 1 minute later, setting FEED = 48°C, return = 30°C, FEED = 31°C; so CI = (31-48)*1 = -17 = -20.

Compressor start 2 minute later, setting FEED = 48°C, return = 30°C, FEED = 33°C; so CI = (33-48)*1 + (-20) = -40.

Compressor start 3 minute later, setting FEED = 48°C, return = 30°C, FEED = 35°C; so CI = (35-48)*1 + (-40) = -60.

.....

Compressor start 25 minute later, setting FEED = 48°C, return = 30°C, FEED = 35°C; so CI = (35-48)*1 + (-480) = -500.

Compressor start 26 minute later, setting FEED = 48°C, return = 30°C, FEED = 35°C; so CI = (35-48)*1 + (-500) = -520.

→ ADD1 switch ON

Compressor start 26 minute later, setting FEED = 48°C, return = 30°C, FEED = 36°C; so CI = (36-48)*1 + (-500) = -520.

Compressor start 27 minute later, setting FEED = 48°C, return = 30°C, FEED = 36°C; so CI = (36-48)*1 + (-520) = -540.

Compressor start 28 minute later, setting FEED = 48°C, return = 30°C, FEED = 36°C; so CI = (36-48)*1 + (-540) = -560.

→ ADD2 switch ON

Compressor start 29 minute later, setting FEED = 48°C, return = 30°C, FEED = 37°C; so CI = (37-48)*1 + (-560) = -580.
Compressor start 30 minute later, setting FEED = 48°C, return = 30°C, FEED = 37°C; so CI = (37-48)*1 + (-520) = -600.
Compressor start 31 minute later, setting FEED = 48°C, return = 30°C, FEED = 37°C; so CI = (37-48)*1 + (-540) = -620.
→ ADD3 switch ON

2) FEED is more than setting FEED

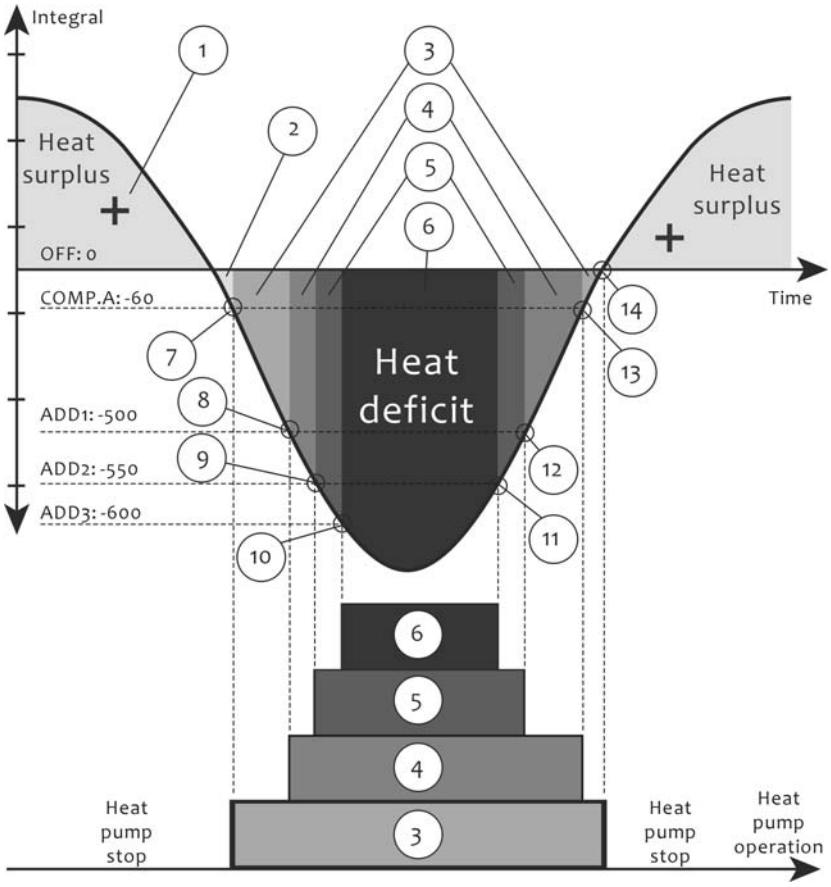
For example, outside air temperature = -8 °C, setting FEED = 48°C. PCB will calculate CI every 1 minute.
0 minute, previous CI = -570, FEED = 55°C.
1 minute later, setting FEED = 48°C, FEED = 55°C; so CI = (55-48)*1 + (-570) = -560
2 minute later, setting FEED = 48°C, FEED = 55°C; so CI = (55-48)*1 + (-560) = -550 **→ ADD3 switch OFF**
...
7 minute later, setting FEED = 48°C, FEED = 54°C; so CI = (54-48)*1 + (-510) = -500 **→ ADD2 switch OFF**
...
51 minute later, setting FEED = 48°C, FEED = 53°C; so CI = (53-48)*1 + (-70) = -60 **→ ADD1 switch OFF**
...
57 minute later, setting FEED = 48°C, FEED = 52°C; so CI = (52-48)*1 + (-10) = 0 **→ Compressor stop**

8.4.5.2 INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control system uses several parameters.

A heat deficit is needed to start the heat pump, and there are four integral values, COM.A (default value = -60), which starts the compressor and ADD1 (electrical heater 1, factory set = -500), ADD2 (electrical heater 2, factory set = -550), ADD3 (electrical heater 3, factory set = -600) which starts the auxiliary electrical heater. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

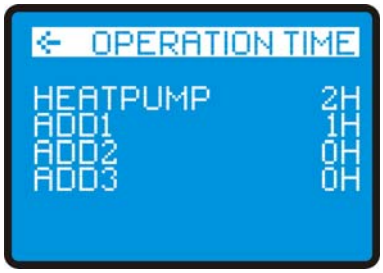
The integral value is a measurement of the area under the time axis and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value reduces to set value for INTEGRAL COMP.A, the compressor starts. If the integral value continues to reduce to ADD1, ADD2, and ADD3 for electrical heater 1, 2, 3 switch ON.



Symbol explanation :

1 Heat surplus, heat pump stop
2 Heat deficit, heat pump stop
3 compressor running area
4 electrical heater 1 running area
5 electrical heater 2 running area
6 electrical heater 3 running area
7 compressor start
8 electrical heater 1 start
9 electrical heater 2 start
10 electrical heater 3 start
11 electrical heater 3 stop
12 electrical heater 2 stop
13 electrical heater 1 stop
14 compressor stop

8.4.5 Sub-Menu OPERATION TIME



Menu Text	Description	Adjustable by:
HEAT PUMP	Total operating hours of heat pump since installation. Operating time will not reset to zero.	USER
ADD 1	Total operating hours of electrical heater (3kW) since installation. Operating time will not reset to zero.	USER
ADD 2	Total operating hours of electrical heater (6kW) since installation. Operating time will not reset to zero.	USER
ADD 3	Total operating hours of electrical heater (9kW) since installation. Operating time will not reset to zero.	USER

8.4.6 Sub-Menu RESET

Reset to factory setting value.

. On main-menu INFORMATION.

Press and navigate to sub-menu RESET.

b. Press 3 second, the screen will display "RESET...".

c. A few seconds later, screen return to main menu,
all parameter reset to factory setting value.

8.4.8 Sub-Menu MAN TEST

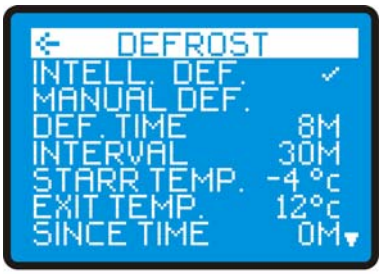
a. On main menu INFORMATION.

Press and navigate to sub-menu MAN TEST.

b. Press 3 second to sub-menu MAN TEST.

c. You can select ON/OFF to test each part.

8.4.5 Sub-Menu DEFROST



Defrost has two mode :

* Intelligent defrost: **start temp and exit temp set by PCB.**
* Manual defrosts: all defrost parameter set by customer.

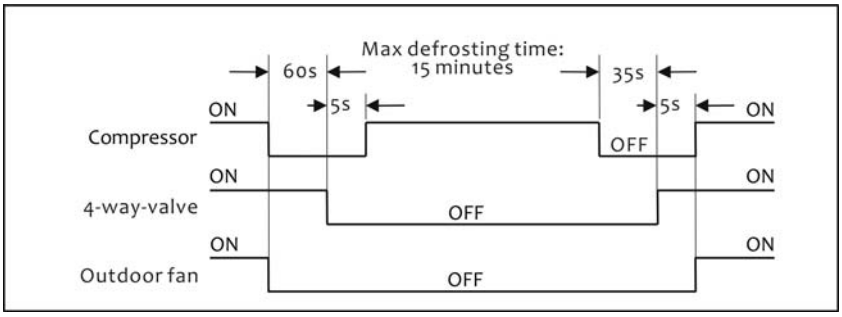
DEF. TIME: range of setting defrost time: (2 ~~ 20 min). Default is 15 min.
INTERVAL: range of setting defrost interval: (25 ~~ 70 min). Default is 30 min.
START TEMP: range of start defrost temperature: (-8 ~~ -15°C). Default is -4°C.
SINCE TIME: Show last value of defrost time. Not adjustable.
BETW.DEFR: Show last value of defrost interval. Not adjustable.

8.4.5.1 Intelligent defrost:

1st defrost start condition (the first defrost period is 40 minutes):

Heat pump first to run, when compressor run continuously for 40 minutes, PCB check if evaporator temperature < -4°C, then start defrosting.

During defrost



Electrical heater switch ON, circulation pump run.

Defrost exit condition:

When evaporator temperature reach to 12°C, or max defrost running time = 15 minutes, Defrost exist.

Next defrost start condition:

The next defrost period will be changed according to last defrosting status, the calculation as following:

Defrost running time (minutes)	1~2	3~4	5~6	7~8	9~10	11~12	13~15
Defrost **INTERVAL** (minutes)	60	55	50	45	40	35	30

6.14.2 Manual defrost:

Defrost start condition:

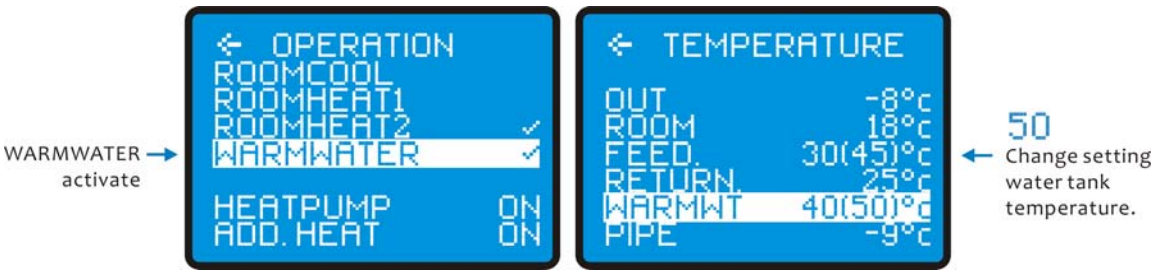
When compressor runs continuously for 30 minutes, PCB checks if evaporator temperature < -4°C, then start defrost.

Defrost exit condition:

When evaporator temperature reach to 12°C, or max defrost running time = 15 minutes, Defrost exist.

8.4.5 Setting for operation mode WARMWATER

The setting range of water tank temperature is 20°C ~70°C.



a. On sub-menu OPERATION, select WARMWATER mode.

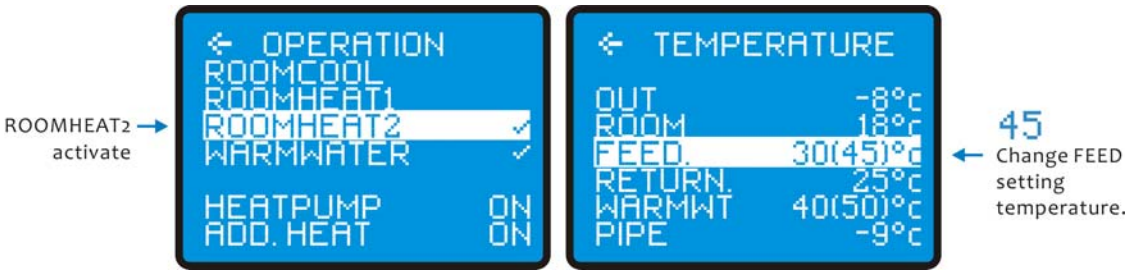
b. On sub-menu TEMPERATURE, press [+] and [−] to navigate to WARMWT.

c. Press [▶] to enter water tank temperature setting, 50 flesh. Press [+] and [−] to increase, reduce setting water tank temperature.

d. Press [◀] to exit water tank temperature setting.

8.4.5 Setting for operation mode ROOMHEAT2

The setting FEED temperature is fixed. The max setting FEED temperature is 45°C.



a. On sub-menu OPERATION, select ROOMHEAT2 mode.

b. On sub-menu TEMPERATURE, press [+] and [−] to navigate to FEED.

c. Press [▶] to enter FEED setting, 45 flesh. Press [+] and [−] to increase, reduce setting FEED temperature.

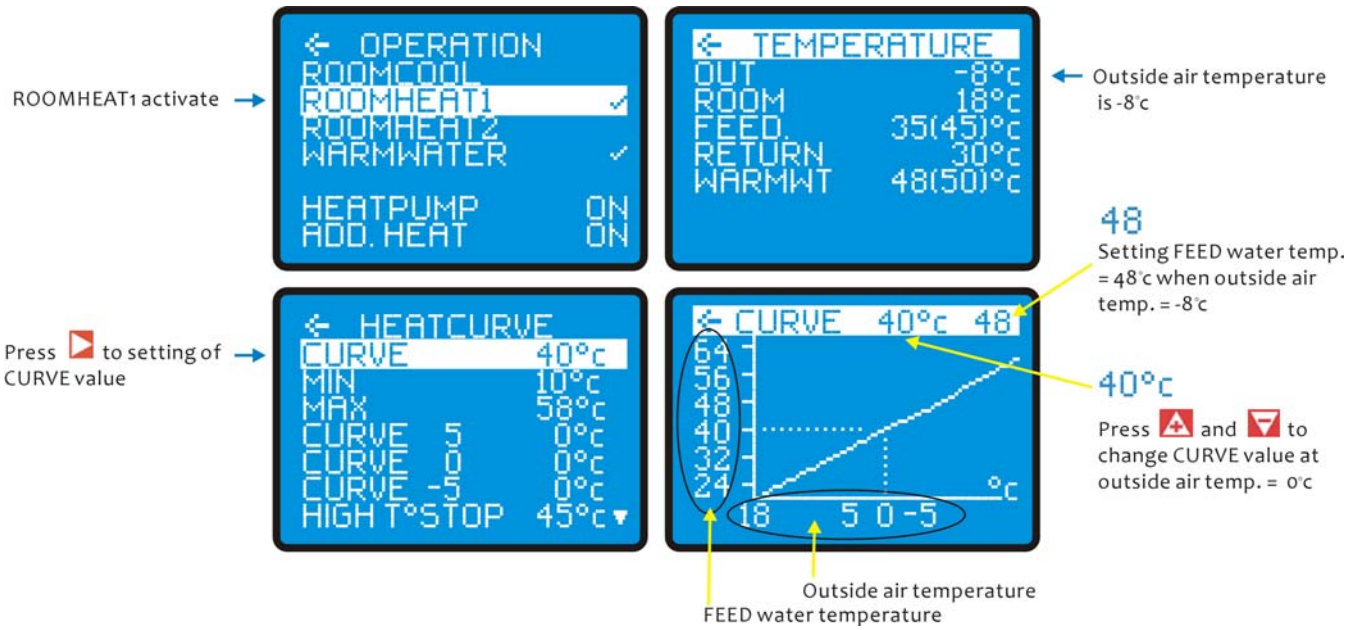
d. Press [◀] to exit FEED setting.

8.4.5 Heat curve for operation mode ROOMHEAT1

The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. In other words, the supply temperature of the water fed to the heating system will increase linearly as the outdoor air temperature falls.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and saves energy.

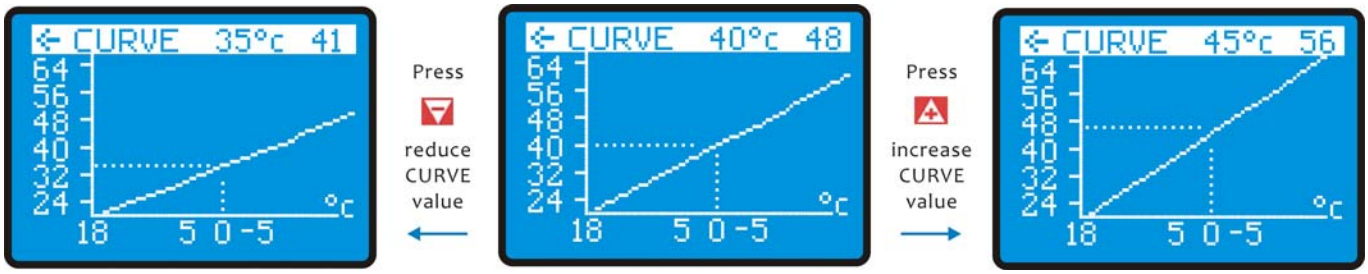
Select ROOMHEAT1 mode, the setting FEED water temperature will change according to outside air temperature. Heat curve is changed by CURVE value, ROOM value and part HEATCURVE :



8.4.6 Adjustment of CURVE value

If you change heat curve by CURVE value, the gradient will change. CURVE value is setting FEED water temperature at outside air temperature = 0°C.

And the setting return water temperature at outside air temperature -8°C change at the same time.



a. On sub-menu HEATCURVE, press and to navigate to CURVE.

b. Press to CURVE value setting. Press and to increase, reduce CURVE value.

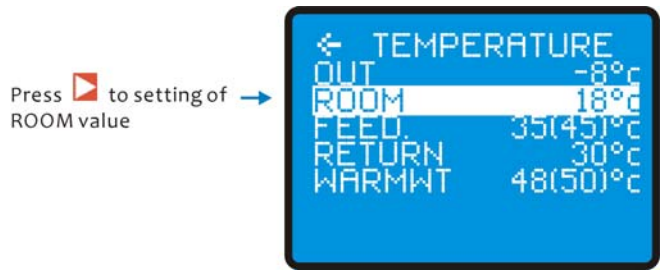
c. Press return to sub-menu HEATCURVE.

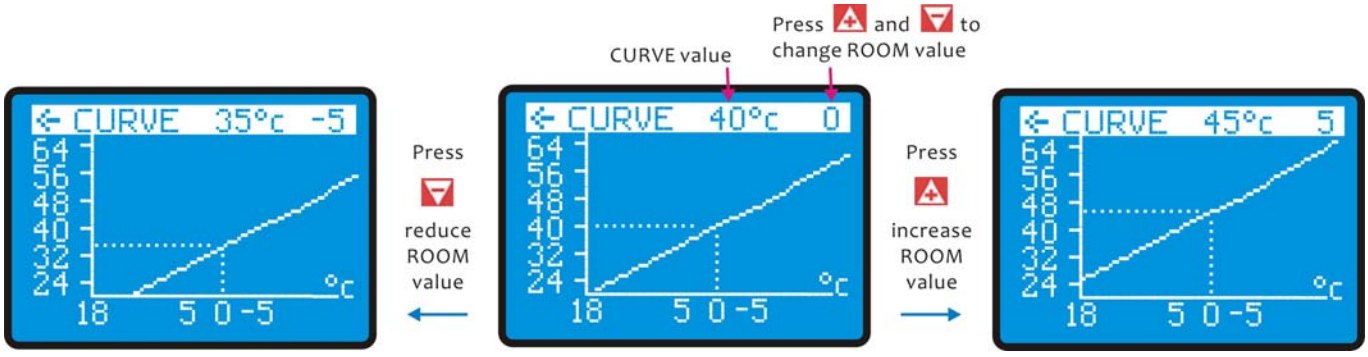
8.4.6 Adjustment of ROOM value

If you change heat curve by ROOM value, the gradient does not change. The whole curve move upwards or downwards based on ROOM value.

Factory setting of ROOM value is 0°C.

The range ROOM valve is -9°C ~ 9°C.





a. On sub-menu TEMPERATURE, press and to navigate to ROOM.

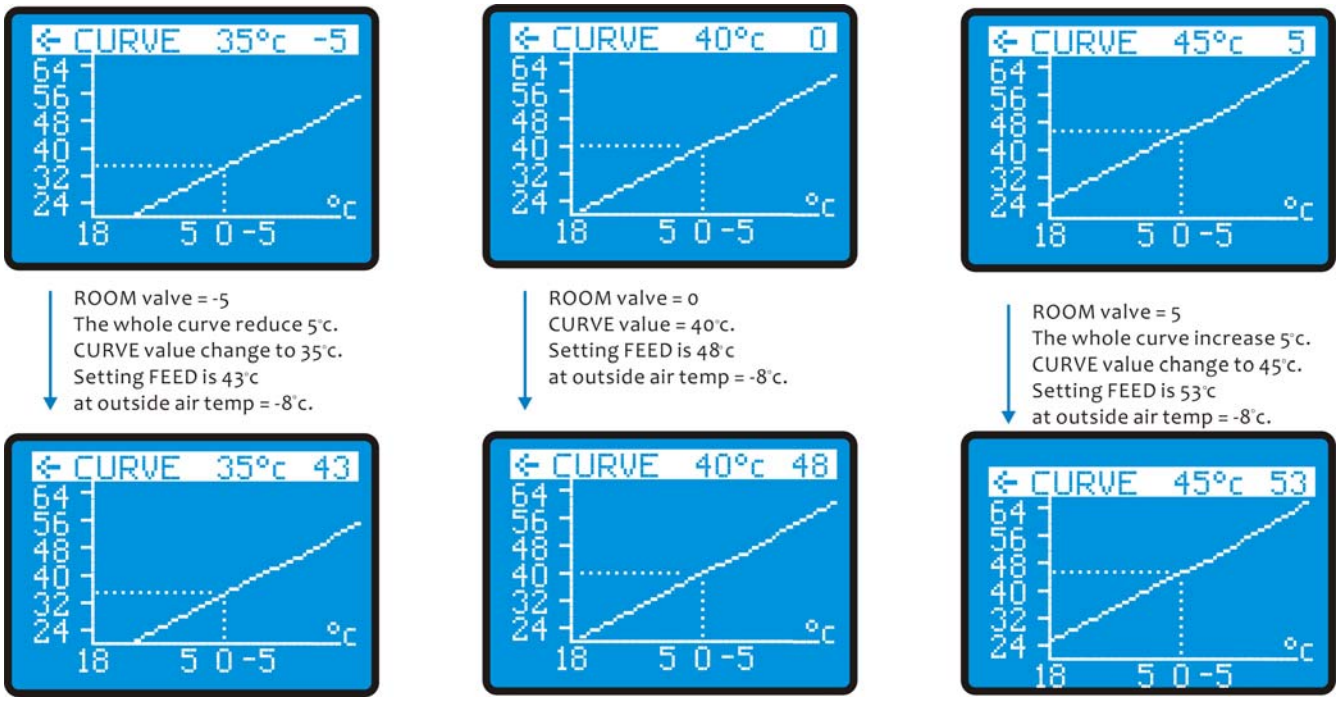
b. Press to enter ROOM value setting, press or to increase or reduce ROOM value.

c. Press to exit to sub-menu TEMPERATURE. Press to exit to main-menu INFORMATION.

d. press and to navigate to HEATCURVE, press to enter sub-menu HEATCURVE.

e. press and to navigate to CURVE, press to enter CURVE valve setting.

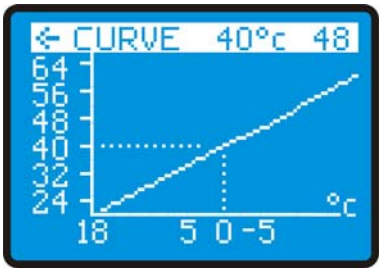
If ROOM value reduce -5, the gradient does not change. The whole curve move downwards -5°C.
If ROOM value reduce 5, the gradient does not change. The whole curve move upwards -5°C.


CURVE 35°c -5
CURVE 40°c 0
CURVE 45°c 5
64 56 48 40 32 24
°c
18 5 0 -5
ROOM valve = -5
The whole curve reduce 5°c.
CURVE value change to 35°c.
Setting FEED is 43°c
at outside air temp = -8°c.
ROOM valve = 0
CURVE value = 40°c.
Setting FEED is 48°c
at outside air temp = -8°c.
ROOM valve = 5
The whole curve increase 5°c.
CURVE value change to 45°c.
Setting FEED is 53°c
at outside air temp = -8°c.
CURVE 35°c 43
CURVE 40°c 48
CURVE 45°c 53

8.4.6 Adjustment of Par t Heat Curve:

You can change partly HEATCURVE at outside air temperatures -5°C, 0°C and +5°C.
The gradient does not change. Only part of HEATCURVE change.
There are three setting on menu: part HEATCURVE 5, part HEATCURVE0, part HEATCURVE -5.
The setting range of part HEATCURVE is -3°C ~ 3°C. Factory setting value is 0°C.

The right picture is CURVE valve 40°C
at outside air temperature 0°C

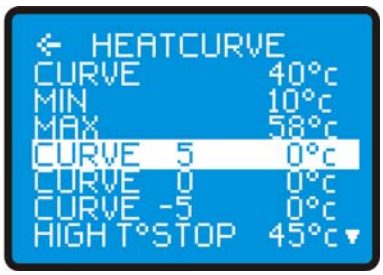


a. Press to exit to sub-menu HEATCURVE.

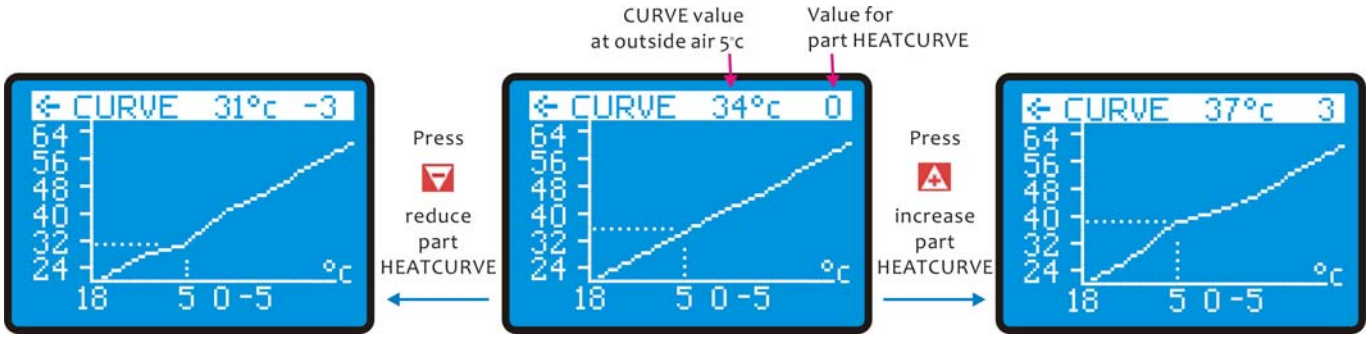
b. Press and to navigate to CURVE 5.

press to enter part HEATCURVE 5

Press to setting of part HEATCURVE 5



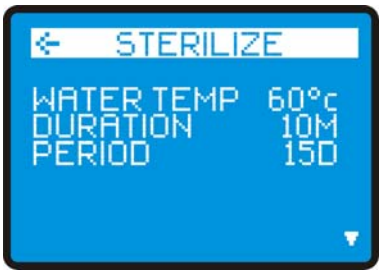
c. Press or to increase or reduce part HEATCURVE 5 value.



d. Press exit to sub-menu HEATCURVE.

8.4.7 sub-menu SETTING:

8.4.8 sub-menu STERILIZE:



8.4.9 Alarm:

If any error on heat pump, the screen will display an alarm message.

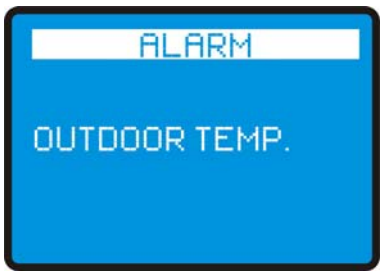


Table: Alarm Messages

Message	Signification
LOW PRESS ERROR	Low pressure switch. Compressor stop.
HIGH PRESS ERROR	High pressure switch. Compressor stop.
MOTOR P ERROR	The relay of compressor or outdoor fan motor is overloaded. Compressor stop.
ADD ERROR	Over-heating protection.
OUT SENSOR	Fault in outside air temperature sensor. The value 0°C will be used for calculation of supply line set point value for HEATCURVE.
FEEDLINE SENSOR	Fault in supply line sensor. All operation stops, except hot water pump.
RETURN SENSOR	Return line sensor fault.
WARM WATER	Error warm water sensor. No warm water production.
ROOM SENSOR	Room temperature fault. The value 20°C will be used for ROOM value on HEATCURVE.
POWER SUPPLY	Alarm that indicates that there is an incorrect phase sequence to the compressor.
HIGH RETURN	Alarm that indicates that high return temperature prevents the compressor's operation.
CMPAIR OVER	Compressor exhaust temperature is more than 105°C. Compressor over-heat protection.

1) Message: LOW PRESS ERROR

Cause	Troubleshooting	remedy
Lack of refrigerant.	**Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.**	**Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.** **If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.**
Electronic expansion valve defective or incorrectly set.	*** Using manometer apparatus and Thermometer check what the over heating reading of the unit is.** *** Also check that bulb and capillary tube are undamaged and that the bulb is correctly installed.**	**If the overheating reading does not correspond with the instructions for the specific refrigerant, adjust the expansion valve until the correct value is obtained. See separate instructions for cooling techniques.** **If overheating cannot be adjusted with the expansion valve or if the capillary tube/bulb is damaged, replace it.**
Cable break or loose cable on low pressure switch	*** Check that both cables are connected to the pressure switch.** *** Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and**	**If a cable has come loose, reconnect it.** **If there is a cable break, replace the cable.**

	circuit board.	

2) Message: HIGH PRESS ERROR

Low pressure switch cut out. Compressor is stopped. No warm water is produced.

Cause	Troubleshooting	remedy
Closed or partially closed thermostats/ valves in the heating system.	**Check that the thermostats/valves in the heating system is open.**	**Open closed thermostats/valves.**
The circulation pump that is defective or has jammed.	**Is there voltage to the circulation pump?**	**Use SWITCH BOARD to check that the circulation pump is active.** **Check if there is voltage to the circulation pump, if there is, and it does not run, the circulation pump is jammed. If this is the case, open the bleed screw and try to release the paddle wheel using a screwdriver for example.** **If there is no voltage to the circulation pump, check if there is voltage from the main board, see wiring diagram. If there is voltage from the main board, check the components between the main board and the circulation pump.** **If a component is defective, replace it.**
Cable break or loose cable to high pressure switch	*** Check that both cables are connected to the pressure switch.** *** Using the buzzer, check that there are no cable breaks. In order to do this, disconnect the cables from the pressure switch and circuit board.**	**If a cable has come loose, reconnect it.** **If there is a cable break, replace the cable.**
Overfilled refrigerant circuit.	**Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.**	**Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant.** **If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action.**
Blocked condenser on the water side.	**If there is no strainer in the heating system, there is a risk of dirt sticking in the condenser and blocking it. Unfortunately there is no easy way of checking if the condenser is blocked.** **You can carry out a test by allowing the compressor and circulation pumps to remain in operation and after a while,**	**If the condenser is thought to be blocked, try flushing it. If this does not work, it must be replaced.**

	check that the pressure pipe becomes hot and that the circulation pumps work (for circ.pumps with a bleed screw, unscrew it and feel if the pump rotor rotates using a screwdriver). Then read the temperature on both connection pipes to the condenser: If the temperature difference is <5°C, the condenser is not blocked. If the temperature difference is >13°C, the condenser is probably blocked.	
Blocked condenser on the refrigerant side.	Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.	If the condenser is thought to be blocked by oil for example, try blowing nitrogen through it to release the oil. If this does not work, it must be replaced

3) Alarm sensor (all)

Cause	Troubleshooting	remedy
Sensor fault alternatively cable fault.	* When reading the resistance of the sensors, the sensor leads must first be disconnected from the control equipment or terminal block. * First take a reading from the sensor including cable and check against the temperature sensor resistance table. * If the read off value does not correspond with the table, only measure the sensor and check the table.	If the sensor gives a correct value, the cable is defective. If the sensor does not give a correct value, the sensor is defective.

4) Message: POWER SUPPLY

Cause	Troubleshooting	remedy
The incoming phases have the incorrect sequence (only applies to 3-phase heat pumps).	* If the text POWER SUPPLY. appears in the display when the heat pump is powered, (only appears in the first 10 minutes) this means that the phases have the incorrect sequence. * When the compressor is running, check the pressure pipe temperature by feeling the pressure pipe. If the phases are correctly sequenced it should be hot (not just warm) even a distance from the compressor. * When the compressor runs with the phases incorrectly sequenced a strange noise may be heard (loud, rattling) when the compressor runs backwards.	If the phases are in the incorrect order, switch two incoming phases at the main terminal block and recheck according to the troubleshooting window.

5) Message: ADD ERROR

Cause	Troubleshooting	remedy
Water flow switch fault.	**Check what the water-flow-switch shows. Is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in Measurement points.**	**If the water-flow-switch is defective, replace it.**
No or insufficient water circulation in the heating system.	**Check: * That the circulation pump spins * That the shut-off valves are open. * That the strainer is not blocked. * That there is no air in the heating system.**	**The circulation pump may have jammed. If so, open the bleed screw and try to release the paddle wheel using a screwdriver for example. Open closed valves or taps. Check, and, if necessary, clean the strainer. If necessary, bleed the heating system according to the installation instructions**
A over-heat sensor 100°C on electrical heater holder switch OFF	*** Water temperature inside electrical heater holder is more than 100°C. * this sensor fault**	**Check insufficient water-flow or block on heating system. Check this sensor.**

5) Message: CMPAIR OVER

Cause	Troubleshooting	remedy
Compressor exhaust sensor fault	**Check what the sensor shows. Is it a plausible/actual value? Measure the resistance of the sensor, check against the ohm table in Measurement points.**	**If the sensor is defective, replace it.**
Lack of refrigerant, not enough refrigerant in the system.	**Using manometer apparatus and thermometer, check that the unit's overheating is correct for the specific refrigerant.**	**Follow the correct procedure (depending on type of refrigerant) to add the correct amount of refrigerant. If there appears to be a leak in the refrigerant circuit, carry out leak tracing and any necessary corrective action. If leak tracer is not available, brush soap water on the suspected leak and look for bubbles. Also check for oil as this can come out from the refrigerant circuit.**

6.16 4-way-valve:

4-way-valve switch ON on heating mode, switch OFF on cooling mode, defrosting.

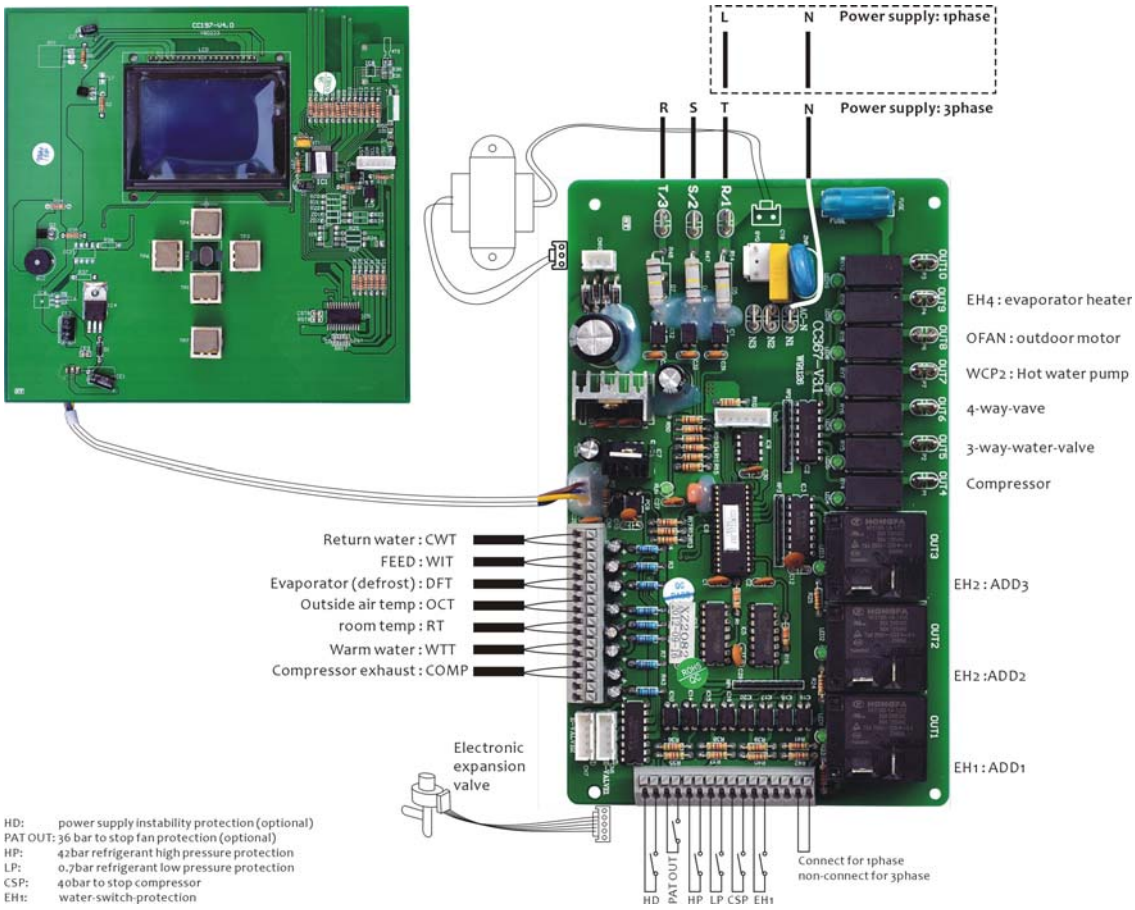
6.17 3-way-water-valve:

3-way-water-valve switches ON on ROOM HEATING/COOLING mode, switch OFF on WATER TANK HEATING, cycle-refrigerant, defrosting. When heat pump stop, 3-way-water-valve switch OFF.

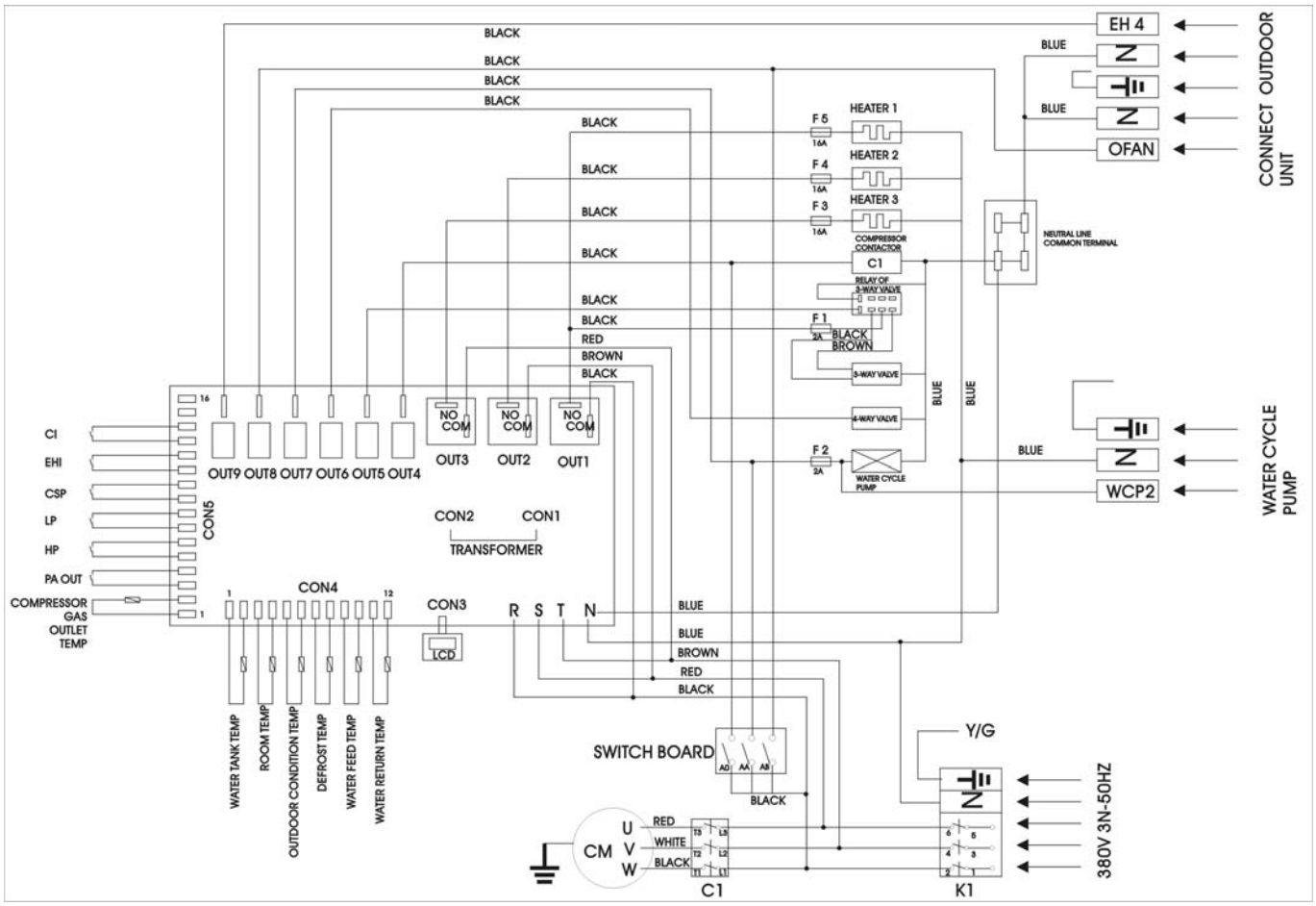
6.18 circulation pump:

In WATER TANK HEATING mode, circulation pump stop when water tank temperature reach to setting temperature.
Circulation pump start when water tank temperature drop down, compressor start.
In ROOM HEATING/COOLING mode, circulation pump run all time. And circulation pump stop when error occur.
In floor heating mode, when Outlet water over-heat protection, circulation pump run.

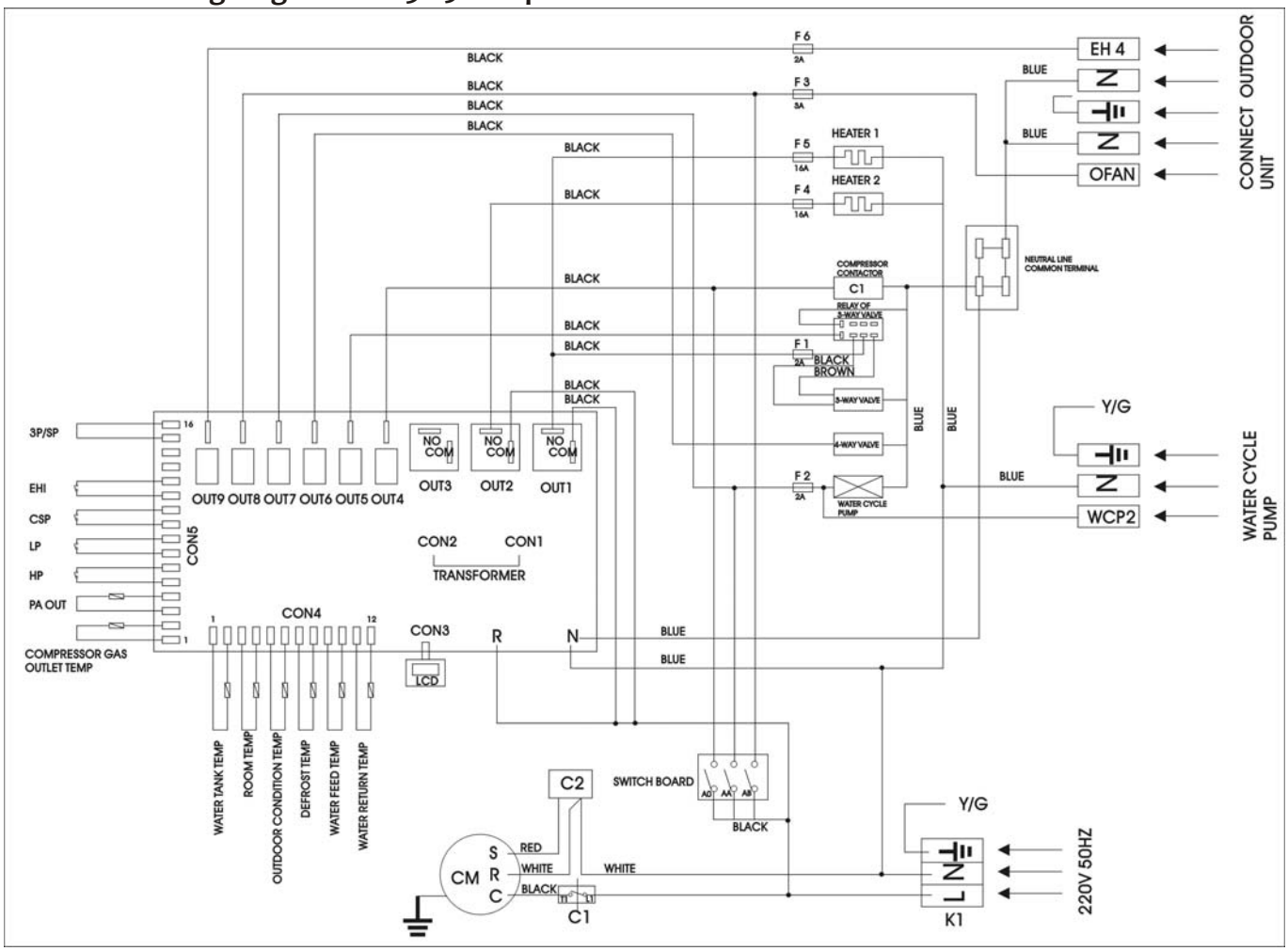
8. Wiring diagram:



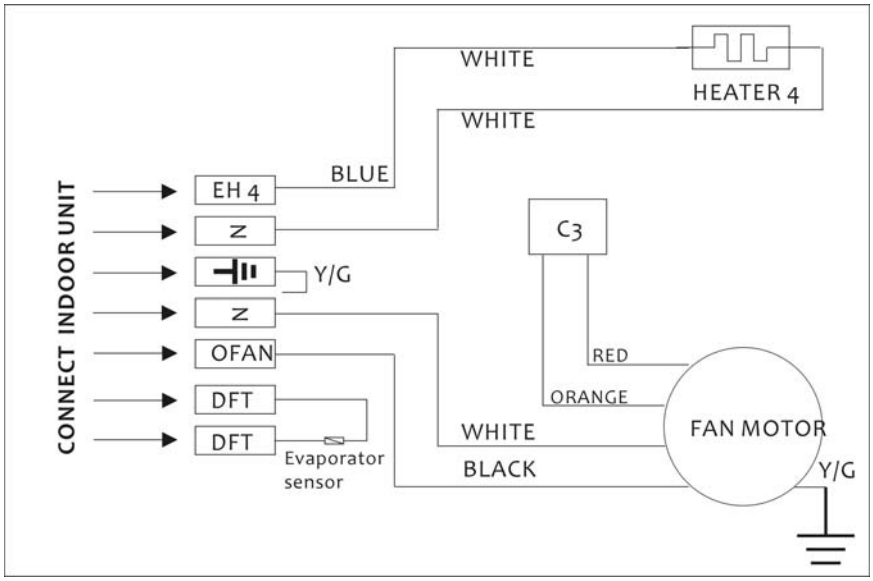
*** Outdoor wiring diagram for 380V-50Hz-3phase**



* Outdoor wiring diagram for 230-50Hz-1phase



* Outdoor wiring diagram for all model



9. Temperature sensor resistance table:

9.1 compressor exhaust temperature sensor resistance t °c -- kΩ 50 k

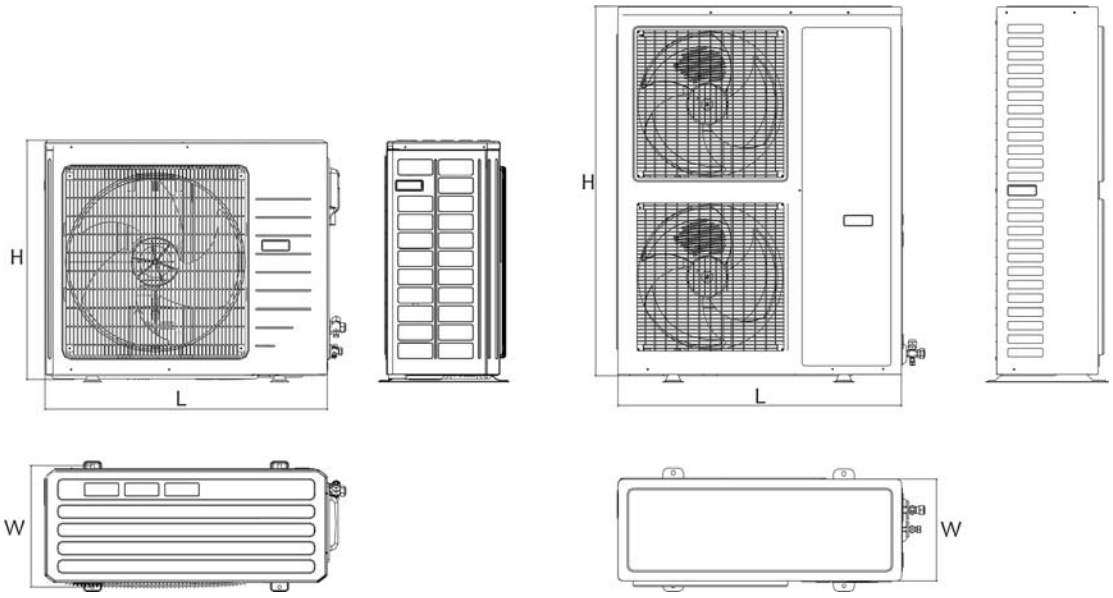
t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)
-30	866.96	-7	234.08	16	75.001	39	27.677	62	11.487	85	5.2629	108	2.6218
-29	815.70	-6	222.02	17	71.625	40	26.578	63	11.083	86	5.0974	109	2.5479
-28	767.71	-5	210.69	18	68.416	41	25.528	64	20.694	87	4.9379	110	2.4764
-27	722.87	-4	199.98	19	65.368	42	24.524	65	10.321	88	4.7842	111	2.4072
-26	680.87	-3	189.86	20	62.474	43	23.566	66	9.9628	89	4.6359	112	2.3403
-25	641.59	-2	180.34	21	59.719	44	22.648	67	9.6187	90	4.4931	113	2.2755
-24	604.82	-1	171.33	22	57.104	45	21.773	68	9.2882	91	4.3552	114	2.2128
-23	570.34	0	162.81	23	54.620	46	20.935	69	8.9706	92	4.2222	115	2.1522
-22	538.03	1	154.78	24	52.253	47	20.134	70	8.6655	93	4.0939	116	2.0934
-21	507.74	2	147.19	25	50.000	48	19.368	71	8.3723	94	3.9700	117	2.0365
-20	479.34	3	140.00	26	47.857	49	18.635	72	8.0903	95	3.8506	118	1.9814
-19	452.68	4	133.21	27	45.817	50	17.932	73	7.8193	96	3.7351	119	1.9280
-18	427.67	5	126.79	28	43.877	51	17.260	74	7.5586	97	3.6238	120	1.8764
-17	404.17	6	120.72	29	42.027	52	16.616	75	7.3077	98	3.5162	121	1.8263
-16	382.11	7	114.96	30	40.265	53	16.001	76	7.0667	99	3.4123	122	1.7778
-15	361.35	8	109.51	31	38.585	54	15.410	77	6.8345	100	3.3120	123	1.7308
-14	341.86	9	104.34	32	36.987	55	14.844	78	6.6109	101	3.2150	124	1.6852
-13	323.53	10	99.456	33	35.462	56	14.302	79	6.3960	102	3.1214	125	1.6411
-12	306.29	11	94.826	34	34.007	57	13.782	80	6.1890	103	3.0310		
-11	290.06	12	90.426	35	32.619	58	13.284	81	5.9894	104	2.9435		
-10	274.78	13	86.262	36	31.297	59	12.807	82	5.7976	105	2.8589		
-9	260.4	14	82.312	37	30.034	60	12.384	83	5.6126	106	2.7772		
-8	246.85	15	78.561	38	28.827	61	11.909	84	5.4346	107	2.6982		

9.2 water/ambient/evaporator temperature sensor resistance t °c – kΩ 5 k

t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)	t °c	R(KΩ)
-20	37.4111	**-7**	19.6768	**6**	10.9023	**19**	6.3328	**32**	3.8354	**45**	2.4091	**58**	1.5618
-19	35.5384	**-6**	18.7693	**7**	10.4393	**20**	6.0846	**33**	3.6961	**46**	2.3276	**59**	1.5123
-18	33.7705	**-5**	17.9092	**8**	9.9987	**21**	5.8475	**34**	3.5626	**47**	2.2493	**60**	1.4647
-17	32.1009	**-4**	17.0937	**9**	9.5794	**22**	5.6210	**35**	3.4346	**48**	2.1740	**61**	1.4188
-16	30.5237	**-3**	16.3203	**10**	9.1801	**23**	5.4046	**36**	3.3120	**49**	2.1017	**62**	1.3746
-15	29.0333	**-2**	15.5866	**11**	8.7999	**24**	5.1978	**37**	3.1943	**50**	2.0320	**63**	1.3319
-14	27.6246	**-1**	14.8903	**12**	8.4377	**25**	5.0000	**38**	3.0815	**51**	1.9651	**64**	1.2908
-13	26.2927	**0**	14.2293	**13**	8.0925	**26**	4.8109	**39**	2.9733	**52**	1.9007	**65**	1.2511
-12	25.0330	**1**	13.6017	**14**	7.7635	**27**	4.6300	**40**	2.8694	**53**	1.8387	**66**	1.2128
-11	23.8412	**2**	13.0055	**15**	7.4498	**28**	4.4569	**41**	2.7697	**54**	1.7790		
-10	22.7133	**3**	12.4391	**16**	7.1506	**29**	4.2912	**42**	2.6740	**55**	1.7216		
-9	21.6456	**4**	11.9008	**17**	6.8652	**30**	4.1327	**43**	2.5821	**56**	1.6663		
-8	20.6345	**5**	11.3890	**18**	6.5928	**31**	3.9808	**44**	2.4939	**57**	1.6131		

10. Dimension

*** Outdoor Unit Dimension**



Model	5kW	7kW	9kW	12kW	15kW	18kW
No of fan	1	1	1	2	2	2
L	840	830	880	830	930	930
W	285	310	360	310	390	390
H	610	710	770	1200	1220	1220

*** Indoor Unit Dimension**